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International
Journal of Orthodontia
and Oral Surgery

VOL. 22 APRIL, 1936 NO. 4

Orthodontia

INTEGRAL GROWTH OF THE FACE*

I. THE NASAL AREA

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IN ALL the applied sciences, medicine and dentistry among the rest, the keynote of progress is likely to be technic rather than knowledge. Orthodontia, at least orthodontia as represented by those practitioners and organizations whose professional association has meant so much to me, for the most part steers successfully between the inelastic virtue of a single-pointed mind and the willful woodenness of an unimaginative one. It is because I am sure of contact with kindred spirits whose eyes are on the facts and whose mind is on the future that I appreciate this opportunity to bring to you, not some doctrine to which I have committed myself and therefore must defend, but thoughts still bubbling from the brain-pan in which they were brewed.

For the opportunity to indulge these thoughts I am altogether indebted to my colleague, Dr. B. Holly Broadbent, whose patient devotion to the scientific side of orthodontia was rewarded by the establishment of the Bolton Study and whose technical skill and meticulous precision made possible the roentgenographic cephalometer, by which determinations of form and growth in the face can be made with accuracy and confidence.[2]

It is owing to the mutual enrichment of each other's program by studying the same children and pooling our results that we have this wonderful opportunity of contributing to the elucidation of the growth pattern of the child.

The records of our long term studies on children now include standard Bolton x-ray pictures and records over a period of five years. It is perfectly

*Presented at the Thirty-Third Annual Meeting of the American Society of Orthodontists, New York, N. Y., April 30, 1935.

possible therefore to construct norms of facial growth at any period of childhood, and it is likewise possible to study both the origin and the course of deviations from the norm.

Every one knows, of course, that faces differ, and most of us are content to assume that the differences are largely due to the hereditary tendencies implicit in the genes. But as the face, like the rest of the body, is a plastic thing and since the adult contours are the end-result of a growth pattern which, in the course of its progress, may be expedited, interrupted, retarded, warped, or inhibited by misadventures of health and by vagaries in the interplay of those organically originated influences by which the pattern is promoted, it is evident that environment, external and more particularly internal, must contribute in no small manner to the final result. This has been emphasized in recent years by Howard[4] and the growth pattern itself propounded in detail by Hellman.[3] To the work of both these intrepid explorers in orthodontic science we owe a great debt.

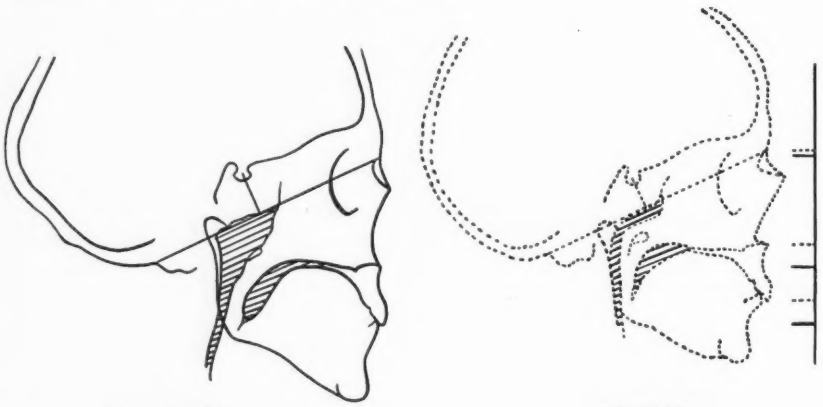

Fig. 1.—Sagittal facial contours of two boys of fourteen years. A ((SS 3678) shows the adequate development characteristic of an accelerated growth pattern; B (SS 2903) shows an average pattern wherein the mandibular and to a less extent the maxillary growth has been slowed down. The horizontal lines indicate sites of frontonasal suture, floor of nose and chin level in the two.

The growth of the respiratory area of the face has already been described by Rosenberger,[7] and the adult features of the area by Pitkin.[6] Pitkin did his work at a time when the full story of the growth pattern was still obscure to us, but the accuracy and the comprehensiveness of his study, undiminished with the years, keep their value, for the work has stood the test of experience and waited only Rosenberger's recent contribution for its full evaluation. In view of these two thorough pieces of work no further description of the part is necessary.

Let us look for a moment at the facial contour of two boys of identical chronologic age, namely, fourteen years (Fig. 1).

In B (SS 2903) the growth pattern has been impeded, so that the facial contour is that characteristic of a younger lad without the full maxillary development and mandibular growth which one should expect; whereas A

(SS 3678) presents contours definitive of an accelerated pattern. We should express this distinction by saying that B is rather younger and A is older than his years.

Now turn to the records of the actual growth patterns of the boys themselves (Figs. 2 and 3). Weight and height are assessed on the Baldwin Wood standards.[1] Physical development is determined by the roentgenographic method which I have previously described.[8] We need not at present concern ourselves with the pattern of mental expansion also defined in these charts.

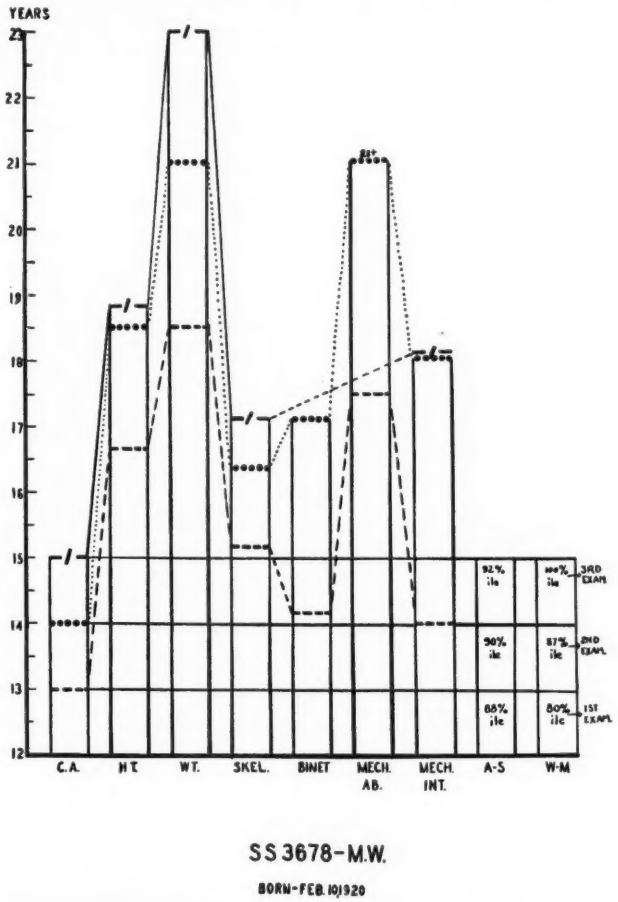

Fig. 2.—Developmental growth record of A (SS 3678). For details see text.

In A the serial assessments have outlined a growth pattern advanced for chronologic age at each examination. In B physical growth and development underwent interruption from eleven years onward, and at the age of fourteen years, two months, the physical maturity of the boy was equivalent to fourteen years, one month, whereas the physical maturity of A stood at sixteen years, four months. One naturally inquires what will be the outcome of the growth pattern in B from the orthodontic standpoint. That further growth will occur there is no doubt, but the growth pattern of A will not be reproduced for adjustments have already taken place between those areas which have continued to grow and those which have been interrupted. The

final pattern of B must therefore be constructed on compensatory lines analogous to those which Wharton and I have described in the experimentally disturbed growth patterns of sheep.[9] Here then is a warning for the orthodontist. The face in which he is called upon to adjust the alignment of teeth is unlikely to present a straightforward growth pattern like that of A in which, having perfected his design, he may count upon its permanency. What he is likely to meet is a pattern analogous to that of B in which facial underdevelopment results in features of growth which imply more or less permanent maladjustment so compensated that an aberrant and possibly unstable end-result occurs. He cannot depend upon the permanency of the

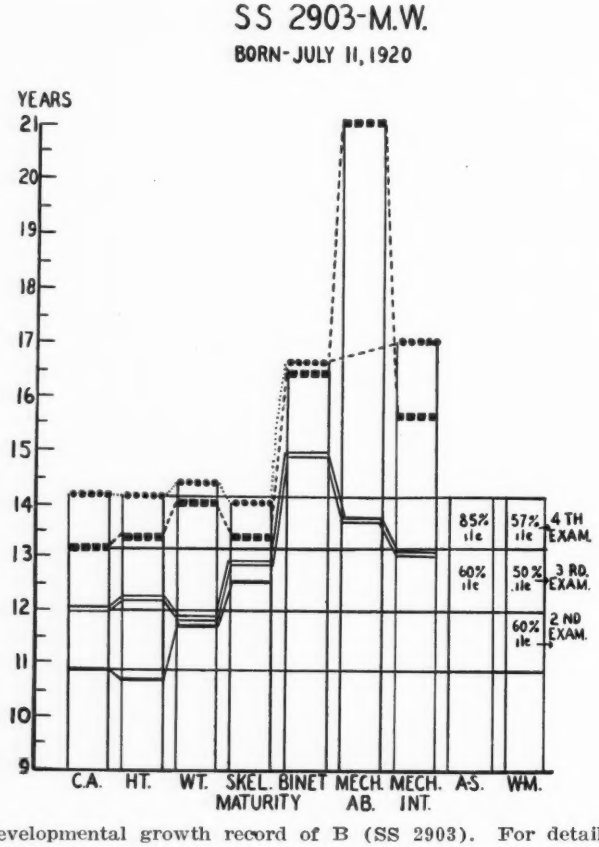

Fig. 3.—Developmental growth record of B (SS 2903). For details see text.

facial construction until a later age, but his expert study of the facial growth pattern will define for him what, up to the present, he has been able only to divine by the intuition born of experience.

As for the cause of the difference between the facial contours of these two lads we have nothing to fall back on at present except the knowledge that the interplay of those endocrine influences which direct the course of physical development or progressive maturation has followed diverse lines in the two.

It is not only constitutional debility which brings about a failure of growth. Growth is but one expression of progressive maturity, but it is the

most obvious expression because it can be measured in dimensions. It is true of course that each of these boys follows, within broad limits, the family pattern, but comparison of the records of each of these lads with those of other members of their families shows the individual differences presented by each within the limits of the family pattern.

Now it is not necessary to await the onset of adolescence to define these individual differences. The problems of the orthodontist start already in the cradle and may be evident in infancy. Figs. 4 and 5 demonstrate this ex-

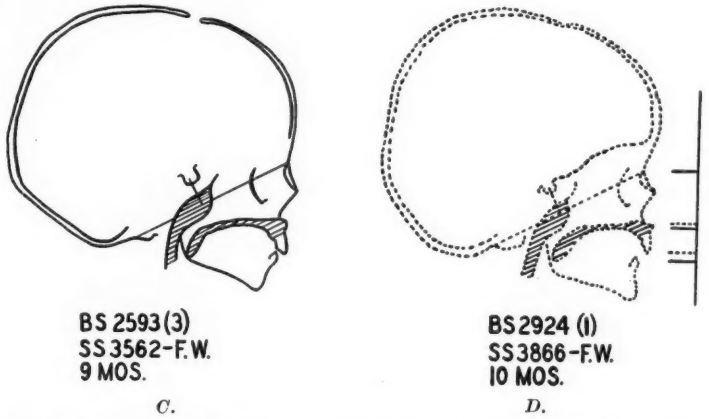

Fig. 4.—Sagittal facial contours of two girls aged nine to ten months. The one, C (SS 3562), is healthy; the other, D (SS 3866), allergic. Horizontal lines as in Fig. 1.

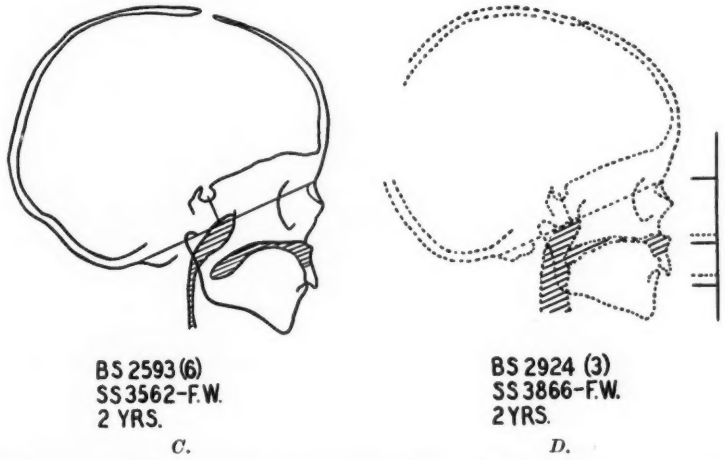

Fig. 5.—Sagittal facial contours of the same two girls C and D at two years. Horizontal lines as in Fig. 1.

ceedingly well. Here are two girls, the one, C (SS 3562), robust, healthy, well nurtured and free from any suggestion of disturbed growth pattern; the other, D (SS 3866), a victim of eczema and gastrointestinal disturbance from birth resulting from a constitutional deficiency defined as allergy. At nine to ten months the distinction between the two facial contours is evident; at two years it is pronounced.

The developmental growth records of these two girls are given in Figs. 6 and 7, the contrast between which needs no emphasis. C is well grown

and adequately developed for her age; whereas D is undergrown and retarded in development in consequence of her constitutional disability.

Fortunately a child suffering from the projectile vomiting, dyspepsia, eczema and feeding difficulties which characterize certain children, even though he present a facial growth pattern retarded as much as that in this example, usually shows no disturbance of brain growth which, not being at the same susceptible stage, suffers little or no interference.

The first claim of this paper is a definite program of growth of the face expedited, retarded, warped or inhibited in consequence of constitutional ill health or disturbances in the endocrine pattern.

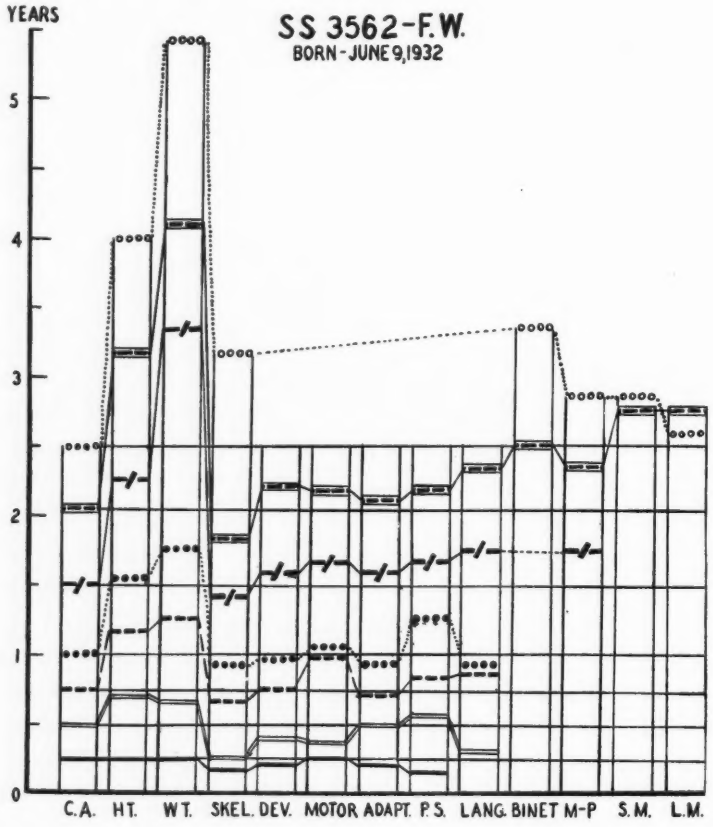

Fig. 6.—Developmental growth record of C (SS 3562), a constitutionally healthy and robust girl. For details see text.

Having laid before you the vagaries of the facial growth pattern and the manner of their definition, it is possible to proceed to the second claim, namely, the complication brought about by adenoid growth in the facial pattern of early childhood.

Figs. 8 and 9 contrast the physical features of the nasopharynx, in which an adenoid growth constricts the passage, with those of the nasopharynx which is free from this encumbrance. It is of course infrequent to find a man of forty-seven years who shows so marked an overgrowth of adenoid tissue, but the figure is convincing in its illustration of mechanical impediment to nasal breathing which can result from this condition. What is rare in adult

life is all too frequent in early childhood when, owing to the relatively undeveloped nasopharynx, an adenoid overgrowth can so easily produce obstruction.

It is only since the precise standardized roentgenograms of the Bolton Study have demonstrated how accurately the adenoid growth can be revealed and objectively measured that one has been able to follow the natural history of the adenoid mass in childhood, its tendency to develop at about twelve months, its increase in size to three years, its stationary condition until adolescence except in those children in whom shrinkage takes place rapidly from eighteen months onward, and finally its gradual recession in size after adolescence.

Other lymphoid masses in the throat, namely, the palatine and lingual tonsils and those masses which spring from the lateral nasopharyngeal wall

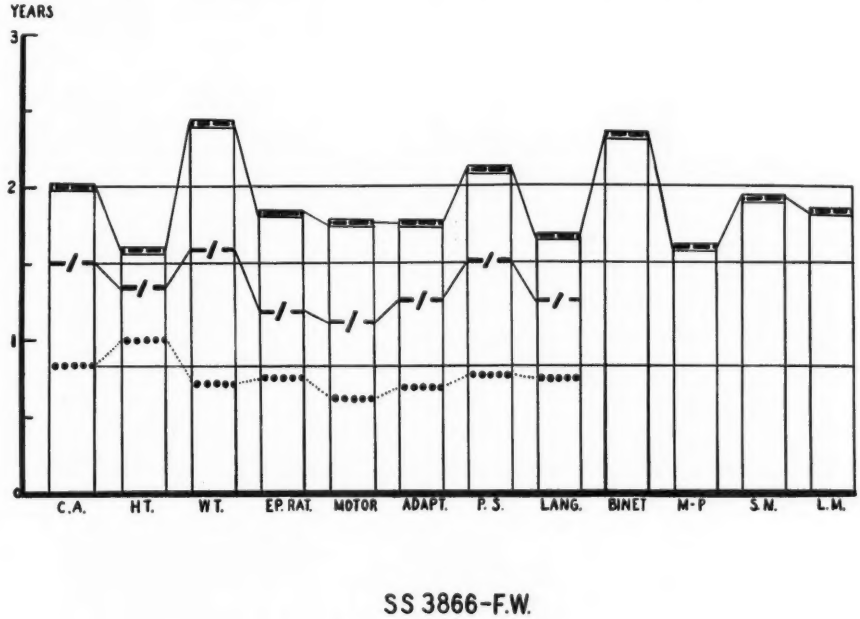

Fig. 7.—Developmental growth record of D (SS 3866), a girl whose constitution is handicapped by the gastrointestinal instability characteristic of allergy in infancy. For details see text.

around the opening of the eustachian tube, all have their bearing on the problem in hand but play a minor rôle compared with the pharyngeal tonsil or adenoid.

Now if the respiratory passage through the nasopharynx be choked by an adenoid mass, the only method of opening up a channel is the depression of the soft palate, and this is most readily brought about, as can be shown in roentgenograms, by thumb-sucking. I do not mean to imply that adenoids are always or the only cause of mouth habits, but it is clear that the presence of mouth habits should direct one's attention to the nasopharynx. Strictly speaking, this takes the dentist outside his regular field; and, if the investigation of the nasorespiratory passage were to call for the technic of the otolaryngologist, the dentist might hesitate to conduct the examination him-

self. If, however, there is in his routine a roentgenographic analysis of the type just mentioned, he has at his disposal a sure means of surveying the area without trespassing upon a colleague's preserve, and of obtaining, first hand, information essential to the success of his management of the case.

Owing to the progressive growth of the nasopharynx in childhood the presence of an adenoid mass after the age of three years does not necessarily mean impeded respiration, for the adenoid is usually stationary in size and the enlarging nasopharynx permits free passage of air. Nevertheless the child remains subject to recurrent pharyngitis and otitis media owing to local obstruction of lateral recess and eustachian tube.

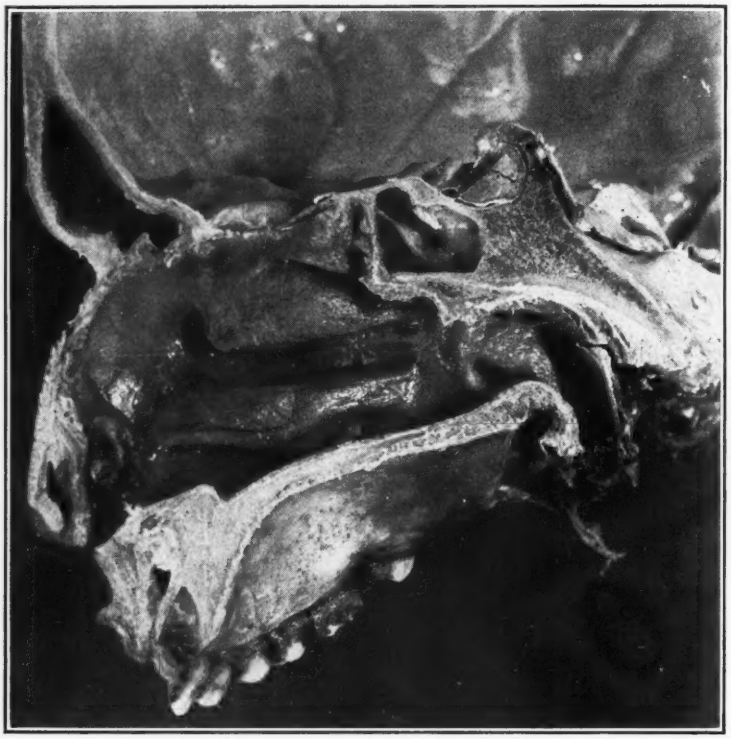

Fig. 8.—The nasopharynx free from adenoid growth. Cadaver 2518, male, negro, aged thirty-four years. Sagittal section. Note the relatively thin posterior pharyngeal wall, the free respiratory passage, and the normal appearance of eustachian tube with the lateral recess behind it.

To conclude this portion of the paper I would draw your attention to Fig. 10, which shows the roentgenographic outline of nasopharynx before and after a successful adenoidectomy. SS 3516 is a girl whose adenoid mass was removed between two and two and a half years of age. The change in caliber of respiratory passage wrought by the adenoidectomy is too obvious to require emphasis.

This section of the paper ends with the claim that simple fleshy adenoid masses may interfere with the freedom of respiratory passage but do not necessarily have any association with physical debility or with the permanence of mouth habits. These conditions tend to cure themselves through the growth of the nasopharynx after the period when the pharyngeal tonsil becomes

stationary, but a marked example at the age of forty-seven years is exhibited in photograph and contrasted with the normal condition of the throat.

The last point to which I would direct your attention is the relation of allergy to the nasorespiratory passage as a complication of orthodontic practice. Allergy may be defined as an undue sensitivity to substances contacted in the environment. Clearly, contact may be made by the skin or by any of the linings of the body passages, more especially the alimentary and respiratory mucous membranes. This sensitivity expresses itself as skin rashes, urticaria, hives; projectile vomiting, indigestion, roseola, scarrings and demineralization of bones; attacks of sneezing, swelling of nasal turbinates and

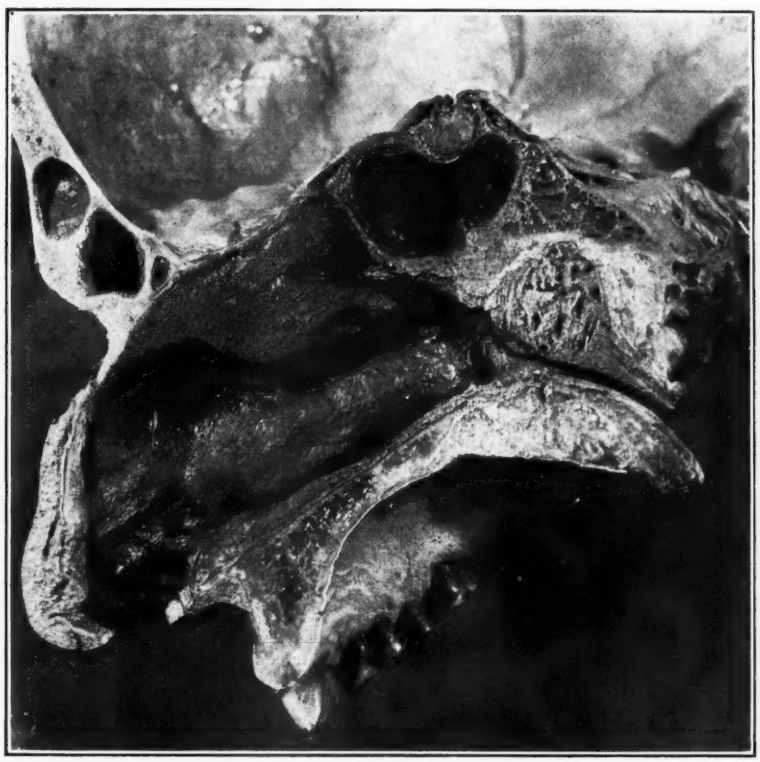

Fig. 9.—The nasopharynx almost choked by a large adenoid (pharyngeal tonsil) growth. Cadaver 2497, male, white, aged forty-seven years. Sagittal section. Note the massive outgrowth from the posterior pharyngeal wall, the obstruction to the respiratory passage, and the covering up of eustachian tube orifice and lateral recess.

adenoids, hay fever, asthma, repeated bronchitic colds; and pyelitis which, though not formally recognized as allergic in origin, is found among or alternatively with the other objective evidences mentioned. Many adenoid masses show rapid fluctuations in size on x-ray examination. They fluctuate conversely with the body weight so that at a season when the child's weight is relatively high the adenoid mass is correspondingly small. These children may be diagnosed as having adenoids at one time and not having adenoids at another. They suffer from dry and itchy noses, from morning sneezing, from a thin discharge which may become purulent after a few hours. They are subject to sinusitis and to ear troubles. They are nervous, restless, very often

shy, apprehensive, troubled with many fears, and after the preschool age become thin, very active and of high standing in the class. If adenoids are removed from these children, the adenoids are very liable to recur, and two or even three operations may be necessary. The adenoid mass may be large after the operation or it may shrink without operation. It is difficult to foretell what will be found at any future time.

The active expression of nasal allergy is a congestion and edema, the latter affecting the adenoid area, the former affecting the turbinates which often change in shape. The removal of an edematous adenoid mass from an allergic child, even if it is not followed by recurrence, may be of little help since the congestion of the nasal area continues the obstruction of the respiratory passages.

The fluctuation in size of the adenoid mass from time to time in allergic children can readily be seen on lateral roentgenograms taken when the child's head is secured in the roentgenographic cephalometer, and it will not

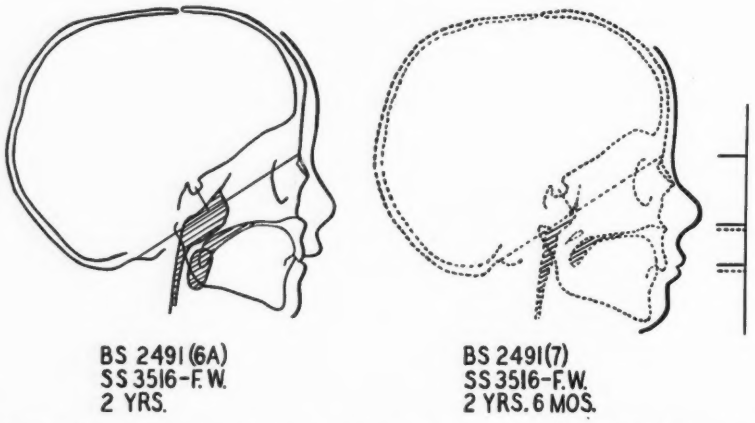

Fig. 10.—Outline of nasorespiratory passage in a girl (SS 3516) at two years and at two and a half years, between which ages adenoidectomy was performed. Note the constricted breathing area before and the widely patent breathing area after the operation. Eustachian tube orifice in broken outline in latter.

be necessary to amplify this record of experience. But a valuable hint on the probable condition of the adenoid mass may easily be secured by serial observations on the child's weight. In active allergy weight increase is impeded: when the allergy is masked weight progress is satisfactory. Reference to Fig. 11 will show an alternation of weight progress in an allergic child contrasting strangely with the regular progress in a healthy robust child. The allergic state is largely responsible for those cases of seasonal weight increase claimed by some physicians and just as strenuously denied by others and more particularly by statisticians who have no information on the health records of individual children. For a discussion of this theme Palmer's recent paper[5] may be consulted.

Experience alone will define the condition of the nasal turbinates which are so clearly evident on the anteroposterior roentgenograms taken of the child's head when secured in the roentgenographic cephalometer. The non-congested inferior turbinates are well-defined scrolls, the bony framework

and soft tissues of which are easily differentiated on the film. Congested turbinates lose this differentiation, appear as uniform dense masses enlarged in outline and partially or wholly blocking the nasal chambers.

The claim of this third section of the paper is therefore the significance of allergy in its effect on the respiratory passages either in temporarily increasing the size of the adenoid mass or in producing a congestion of the nasal turbinates equally effective in causing obstruction of respiratory passages and thus producing mouth habits which in turn call for and impede the corrective attention of the orthodontist.

The general conclusions of the whole presentation are that the orthodontist has really a great and constructive interest in the anatomical form. in the growth pattern, and in the physiological state of the nasal passages.

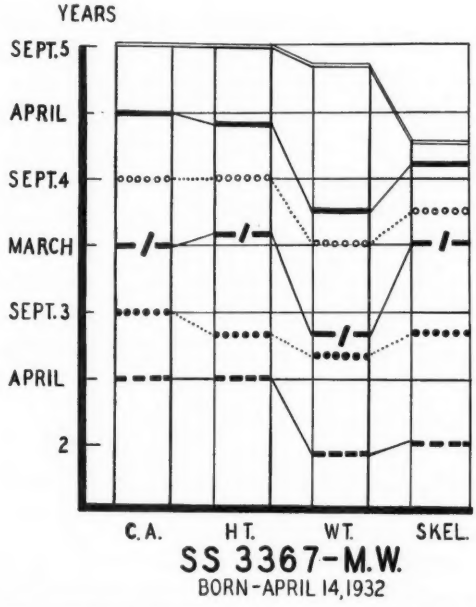

Fig. 11.—Typical developmental growth record of a child showing alternations of active and masked allergy. SS 3367, male, white. The allergy is active in the winter months and the laggard weight progress in these months is the outward symbol.

and it is impossible for him to attain the good results which he seeks so long as there is a center of disturbance in the neighboring area of the face reducing the efficacy of his procedures.

SUMMARY

1. The first claim of the paper is a definite program of growth of the face expedited, retarded, warped or inhibited in consequence of constitutional ill health or disturbances in the endocrine pattern.

2. The second section of the paper ends with the claim that simple fleshy adenoid masses may interfere with the freedom of respiratory passage but do not necessarily have any association with physical debility or with the permanence of mouth habits. These conditions tend to cure themselves through the growth of the nasopharynx after the period when the pharyngeal

tonsil becomes stationary, but a marked example at the age of forty-seven years is exhibited in photograph and contrasted with the normal condition of the throat.

3. The claim of the third section is the significance of allergy in its effect on the respiratory passages either in temporarily increasing the size of the adenoid mass or in producing a congestion of the nasal turbinates equally effective in causing obstruction of respiratory passages and thus producing mouth habits which in turn call for and impede the corrective attention of the orthodontist.

4. The general conclusions of the whole presentation are that the orthodontist has really a great and constructive interest in the anatomical form, in the growth pattern, and in the physiological state of the nasal passages, and it is impossible for him to attain the good results which he seeks so long as there is a center of disturbance in the neighboring area of the face reducing the efficacy of his procedures.

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DISCUSSION

Dr. Harry Neivert, New York, N. Y.—I was under the impression that Dr. Todd was an anatomist. From his admirable presentation, I am led to conclude that he knows more about rhinology than many rhinologists. It is too bad that it was not expedient to invite all the nose specialists to be present. I am sure that they would have profited immensely. I certainly have. Orthodontists who have had proper training and who keep up with the broader aspects of the specialty are aware of the close relationship between the nose and pharynx and the development of the alveolar arches, palate, and teeth. Dr. Todd has given graphic demonstration of this. In our classes at the Columbia Dental School, I have constantly emphasized these facts, and I am in absolute accord with everything Dr. Todd has said.

The time necessarily allotted for discussion is too short to cover this vast subject adequately. I cannot refer to the importance of endocrine imbalance, hereditary make-up, lack of vitamins, etc., except to state that we are just beginning to understand these fundamental topics. I shall devote my time to a brief discussion of adenoids and allergy from the clinical aspect.

Dr. Todd has very properly stated that as the nasopharynx grows and becomes more capacious, the size of the adenoid mass does not cause interference with respiration. This is true, provided that the patient does not suffer from recurrent colds which cause the adenoid to swell, first from congestion and then from hypertrophy and hyperplasia of the lymphoid and connective tissue elements. The adenoid is generally affected by the same pathologic sequences as the faucial tonsil. It is also axiomatic that, when present, the adenoid is simultaneously involved with the tonsil.

The bony framework of the nasopharynx is fairly constant. The base of the occipital bone, the sphenoid bone, the posterior edge of the nasal septum and hard palate are definite and with rare exceptions cause no interference with respiration. In twenty-two years of clinical experience, I have had but two cases of congenital obstruction of the posterior choanae, or nares, both being unilateral. Both patients consulted me because of a profuse, heavy greenish discharge from the nose which had lasted a long time. They were cured, not by operating on the sinuses but by establishing proper nasal respiration by removal of the bony closure and the posterior third of the nasal septum. Needless to say, both suffered from deformities of the face. These were asymmetrical development of the external parts of the face, as well as high irregular palatal arch and irregularity of the teeth, and lack of development of the sinuses on the affected side. You can well understand that since the sinuses are respiratory organs, lack of use must necessarily cause lack of growth. All organs of the body must be utilized for the function nature intended if they are to develop normally.

It is interesting to note that adenoid hypertrophy is not a new disease. Hippocrates recognized that a high arched palate and irregular teeth were associated with an adenoid facies. The first scientific description was written by Santorini in 1724. But before that, artists and sculptors of the Renaissance and even of antiquity depicted faces of adenoid sufferers. Adenoids are found in all climates; the Eskimos have them, and the Malays have them. It seems, however, that they are more prevalent in temperate cold, damp climates such as Northern Europe and the United States. Osler stated that there were more mouth-breathers to the acre in England than in any other country. As one goes farther south in Europe, the prevalence decreases.

The presence of adenoids per se is not an indication for operation. The frequency of colds, infections of the ears, deafness, improper nasal breathing, if definitely proved not due to intranasal pathologic conditions, are to be considered as indications for adenoidectomy. In young children a chronic running ear, which is always a chronic mastoiditis, can often be cleared up by removing the adenoids. The size and the configuration of the nasopharynx, best determined by the method being demonstrated by Dr. Todd and Dr. Broadbent, must be given due consideration. The anatomic and pathologic changes in the nose must be investigated and provision made for their correction. May I here say a few words about the treatment of nasal obstruction due to a deflected septum. Most rhinologists will advise that this deformity, which is the eventual cause of chronic sinusitis and the long list of more or less serious consequences which follow it, should not be operated until the patient is about seventeen years old. Such a statement is inimical to the patient's welfare and shows an utter and inexcusable lack of knowledge of the latest work in this field. There are several operations which can be done without in any way interfering with the normal growth of the nose. In fact, permitting such a deformity to exist will surely interfere with proper development.

Dr. Todd has emphasized the great importance of allergy in the causation of recurrent adenoids. This is an observation of great importance, and I wish to elaborate on this topic. I feel rather competent to discuss it because in the past few years I have been compelled to be an allergist as well as a rhinologist. I found that I was being consulted frequently by parents whose children were having difficulty in breathing despite the fact that the tonsils and adenoids had been removed. Here, I want to emphasize the fact that it is more difficult to remove the adenoids properly than the tonsils. I cannot here go into details, but I can say that any rhinologist who is at all honest with himself and who carefully observes his results will bear me out.

How can you as orthodontists know whether your patient is allergic? If he is, chances are that his breathing is interfered with to a great extent, and this will undoubtedly retard the proper progress and permanency of your work. You should delve into the medical history of the patient and ascertain whether he suffers from frequent colds, sneezing, nasal obstruction, coughing, and a host of other symptoms which I shall show on the screen. You may elicit a history of other members of the family who suffer from hay fever, asthma, or related afflictions. Allergy is really not hereditary. We do inherit a tendency to become hypersensitive. Given that weakness, the degree and manner of subsequent contact with foreign proteins or allergens will determine exactly to what we will become sensitive. This is a vast subject which I cannot discuss at this time.

In addition to the history, there are certain signs that should lead you to suspect an allergic basis. If you will tilt up the tip of the nose and glance at the septum and turbinates, you will note the color and presence of secretion. If pale pink to white or bluish white, the patient should be suspected of being allergic. If the adenoid has been removed, it may have regrown. If not, the turbinates may be swollen and respiration blocked. These patients are really miserable, and it is unnecessary for me to dwell on the many symptoms from which they suffer.

I know that you want to hear what can be done in such cases. It is not possible to cure all cases of allergy, with our present knowledge, but those patients who are not cured by removing the offending protein or proteins can be made comfortable and symptom-free by injection of gradually increasing doses of allergenic proteins. The swollen nasal mucosa may be reduced by several measures at our disposal. We have had varying results by the application of pure phenol to all the nasal membranes. Injections of alcohol or intramural coagulation of the inferior turbinates give relief. Lately, ionization has given gratifying results. Surgery should be the last thing, except for removal of polyps or adenoids when large.

Dr. Todd's paper should impress all of us with the close relationship between orthodontia and rhinology and with the importance of having a thorough knowledge of the patient's nose and pharynx so that results will be as near perfection as is possible in dealing with the vagaries of the human body.

ORTHODONTIC FAILURE*

Case Report

Alfred Paul Rogers, D.D.S., Boston, Mass.

IT IS an easy task to write of our successes; it is more difficult to relate our failures, but more essential. In our daily routine we meet with success and failure, and by encountering them our knowledge becomes surer, our judgment more acute, and our value to society greater.

In the past it has been our tendency, as we met together for mutual consideration of our problems, to place our best foot forward, to talk of our accomplishments, and by so doing we have advanced—we have accomplished. Our offices have been the laboratories in which the trial-and-error method has held a prominent place. It is because of the bitterness of our failures that we seek to forget them when we meet together to advance our common understanding. Now some one among us has wisely asked that we discuss the failures we like to forget.

The field is rich in material—let it be widely and wisely cultivated, but let it be done with understanding and in the spirit of true science. It should then yield a harvest more abundant than we are able to foretell.

I have elected on this occasion to relate to you, briefly, my experience with an unusual case of mesioclusion. The case is that of a young man fifteen years of age who had previously been treated for the condition that existed when he came to me. The usual models and radiographs were prepared and plans for treatment made. Maxillary and mandibular appliances were designed to correct the arch form and at the same time to give opportunity for the use of intermaxillary elastics.

My experience in the treatment of mesioclusion cases had been particularly gratifying, and I looked forward confidently to the customary responses in tissue change and in arch position to the point where it would be possible to place the patient upon myofunctional treatment. The initial treatment under the influence of appliances and intermaxillary elastics continued for some months without the response I had confidently expected. I believe I was a little tardy in recognizing that this particular individual was placing a challenge before me which would require something more than my previous experiences had given me. Months of treatment passed with no appreciable improvement, when the disconcerting discovery was made that the maxillary molars which were used as anchor teeth were becoming elongated with hyperplastic manifestations. It was noticed at the same time that all teeth, in both maxillary and mandibular arches, on which there was the slightest strain from intermaxillary elastics were

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showing a tendency to supraversion, accompanied by extreme instability. Had this young patient not been in apparent good health I should have suspected some unrecognized systemic condition which might affect the reaction of bony tissue to mechanical stimulation.

The treatment was, however, carried on with anxious care for a few months longer when I determined to cease treatment and give the tissues a rest, but I kept the patient under observation. During this period it was noticed that the slight correction which had occurred during the period of treatment gradually relapsed to the former malocclusion, and at the same time the teeth became stable with no evidence of injury to the alveolar process. Inasmuch as the case was one which demanded correction if at all possible, after six months another attempt was made with even greater care being used, and more teeth were used as anchorage than in the former attempt. During this period of treatment I was able to make a little further progress toward the normal but was unable to gain sufficient movement to obtain a position of mechanical advantage where the masseter-temporal exercise could be prescribed.

The use of more than one light elastic on either side was found to be out of the question with this patient. All progress in the correction of mesiodistal relation seemed to cease just short of that position where exercises would have been of the greatest benefit. Upon his return from a vacation, following our second attempt, this patient presented a low grade Vincent's infection which had invaded the area of the third molars which had been extracted during his vacation. Under these circumstances it was thought advisable again to remove all appliances and to subject the patient to a thorough treatment for Vincent's infection. During this period of about three months, while the patient was free from appliances, there was very little change in tooth position. Encouraged by this fact, it was decided to make a third attempt, but with the added disadvantage of the young man now being away at college.

The medical history of this young man might possibly throw some light upon the condition, as there are allergic manifestations with accompanying rhinitis and hay fever, but it is difficult to believe that this condition could be responsible for the unusual tissue responses that have been experienced. His medical history gives no indication of endocrine imbalance. All we do know is that this individual organism refuses to yield to our prescribed methods for the correction of mesioclusion—the maxillary arch refuses to develop buccally and the mandibular arch resists our efforts to reduce its width in the premolar and molar regions.

We all recognize that individuals differ widely in their responses to stimuli, but in my experience I have never seen the pendulum swing so far in one direction.

During certain critical periods in treatment, through lack of cooperation, the patient handicapped our efforts to a considerable degree; but I am not inclined to believe that this indifference or lack of cooperation at these particular periods could properly be ascribed as seriously affecting the treatment as a whole.

In giving this brief history, there comes to my mind as a contrast the case of a young man twenty-two years of age who had a much severer type of mesio-

clusion, who has received practically the same type of treatment and whose responses have been so completely satisfactory that six months' treatment has seen his difficulty almost corrected.

In contrasting these cases I am unable to assign a scientific reason why one case should persist in resisting all efforts and the other should yield with such facility. Yet there is an undiscovered cause for such behavior.

It is possible that some of you have treated similar cases successfully and have discovered the cause of resistance.

FAILURES*

JOHN V. MERSHON, D.D.S., SC.D., PHILADELPHIA, PA.

FAILURES are widely discussed in the world of orthodontia with the thought in mind, no doubt, that we can profit by studying our mistakes. We may approach the problem in a number of ways, but I believe that I can contribute most by offering an analysis of the factors involved in failures rather than by giving a detailed description of various failures.

There are two kinds of failures in orthodontia—ours and Nature's! Every case of malocclusion is, first of all, evidence of a failure in the developmental processes in growth. The word "failure" indicates an inadequacy, a goal aspired to but not reached. This inadequacy may be expressed in the organism as a result of faulty development or as a result of unintelligent treatment.

Our goal is normal occlusion. Whether or not it can be attained depends upon the degree of variation from normal which is present in the patient. There is an individual variation in all human beings, and variation in form is inseparably related to variation in function. Variation may be so minute as to be unseen or so gross as to be a growth anomaly. When variations are of an extreme character, they doom a case of orthodontia to permanent failure from the standpoint of normal occlusion. There are inherent factors which cannot be altered which make normal occlusion impossible. Some teeth are too long, others are too short. There may be a discrepancy in the amount of tooth material in the two jaws. Variations in the size and shape of the cusps of the teeth, as well as in the teeth themselves, further handicap us. Variation in responsiveness to treatment must be reckoned with. Certain cases go along easily; while others which look much the same cause constant worry and never show an entirely satisfactory result. This is evidence of a definite fault in growth.

In some cases, although we establish a correct molar relationship, there is always a spacing of the teeth of one jaw or a crimping of the teeth of the other, or there may be a unilateral mesioclusion or distoclusion.

The elasticity of the term failure is evident because, although such cases are failures from the viewpoint of normal occlusion, they may be successes from the standpoint of use and function. We have two standards of success and failure, one the mechanical arrangement of the teeth; the other, the standard of function.

There has been a tendency in the past to blame malocclusion on a fault in the bone or teeth themselves. We have learned that it is not only the result of variations in teeth and in the osseous structure but also in the function of all correlated parts.

In cases in which the alveolar process is poorly developed, the arches narrow, the musculature flabby and the peridental membrane, if it could be ex-

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amined, probably imperfect, we find that a comparatively short time after treatment has been begun, the soft tissues around the teeth and the alveolar process start to break down and a general recession on the buccal sides of the teeth under treatment results. No matter how carefully work is done, this recession sometimes continues and we are compelled to stop treatment. Is this a failure in treatment or is it something in the growth processes of the organism with which, in the light of our present knowledge, we are unable to cope?

The general physique must be taken into consideration in estimating our chances of success in treatment. We must not be unmindful of the part which heredity may play. But whatever the cause, every case of malocclusion is, first of all, evidence of failure in the developmental processes of growth.

Although we cannot attain the ideal occlusal relationship of the teeth, we are justified in undertaking treatment of cases of this character, because we can so greatly improve function.

Whether our goal be ideal occlusion or merely adequate function, our only hope of reaching it is by means of the developmental processes in growth. Growth is increase in bulk, while development is the adaptation of that bulk to special functions. We know so little about growth that we might aptly call it the unknown, or X, quantity. We cannot see it take place, but evidence in both the plant and the animal world shows that various factors, many of them obscure in the light of present knowledge, may cause it to be retarded, inhibited, or accelerated in a variety of directions.

Our only remedy for malocclusion is the application of force by means of some mechanism. We must keep in mind that this force is used to compensate for a deficiency in developmental growth processes. Our force should be a stimulating measure, acting as an auxiliary to natural growth, and should not run counter to the growth forces of the organism. As I have said before, we know so little about the speed of growth, the direction of growth, and the retardation of growth, that we should interfere with this developmental process as little as possible. There seems to be a tendency among orthodontists in their treatment to disregard the fact that growth is our problem.

Up to this point we have been discussing the inherent factors in the individual which may lead to failure in orthodontic treatment. There are other factors which are not inherent in the patient which may lead to orthodontic failures. I refer to errors in treatment which reflect the lack of appreciation of variations and the factors involved in growth. Orthodontists treat too soon, too continuously, too rapidly, and, as an outgrowth of these abuses, they use retainers.

There seems to be an unexpressed feeling that the orthodontic appliance can do no wrong. How far from the truth! There is probably no other organ which is subject to such abuse in the name of treatment as is the oral cavity. In pharmacology, the first thing which is taught is the fear of drugs and the harm they may do to tissues and organs. Should not orthodontia teach, first of all, the potential harm of orthodontic appliances?

I quote from an article[1] by Dr. Milo Hellman: "So far, some of us have learned to talk about development, but most of us have not yet overcome the impulse to do things which oft interfere with it."

We should undertake treatment only as a last resort, for we know so little of the direction of growth of an individual that we can never be certain we are not interfering with natural processes.

The fact is, some operators begin cases too soon. There is too much treatment of the deciduous denture. Anything which we place in the mouth is a potential inhibitor of normal growth. For this reason we should not interfere with natural development in the deciduous denture unless there be a definite functional disharmony which must be corrected. After such a correction is made, no further treatment may be indicated for several years.

I presume the belief which impels orthodontists to begin work in the deciduous denture is that corrections, made early, will be reflected in an improvement of the permanent teeth and alveolar process when they develop.

This reasoning is fallacious because the deciduous alveolar process goes with the loss of the deciduous teeth and the permanent teeth are supported by a new alveolar process which develops as the teeth erupt. Furthermore, we see so many cases of malocclusion in the permanent teeth following a beautiful occlusion of the deciduous teeth that it makes us wonder why orthodontists feel that they, through treatment, can influence the permanent dentition for the better, when natural growth processes so often operate in the opposite direction. What generally results from treatment of the deciduous denture is an increased rapidity of the resorption of the roots of the deciduous teeth and, in consequence, of the deciduous alveolar process.

A second error in treatment which often leads to failures is too continuous treatment. Growth is a natural attribute of a developing child. Our task is to guide and direct it. Inasmuch as we know so little about the direction of growth, is it not a reasonable assumption that appliances, left in the mouth constantly, may seriously interfere with normal function of the tissues? The appliances act as a splint and may prevent natural development. If they be removed from time to time, the tissues can recuperate from this artificial stimulation. In certain cases, several years should elapse between stages in treatment.

A third cause of failure is too rapid treatment and the attempt to complete cases too soon. This aim for speed seems a little absurd. Children go to the dentist, the physician, and the oculist at regular intervals. Why, then, should the orthodontist assume that his work must be completed in a certain length of time?

Growth is a variable in its degree, its form, and in the time of its completion. Some individuals mature at sixteen years, others at twenty-five. The various stages of development in growth are correspondingly accelerated or delayed.

If a condition be corrected during the active growth period, what assurance have we that the forces in development which were expressed in the malocclusion have been removed by treatment and will not again exert influences which will bring about a return to the former condition? Nature has a plan, although we do not today understand all phases of it. One thing we know is that growth goes on in steps and stages until maturity is reached. Dare we run a race with Nature and expect to win? The operator who does this should be disqualified

because he is not playing the game fairly. He is trying to do something not because it is right but because to his dim perception it seems expedient.

Adolescence brings with it not only the very evident changes but also a host of subtle alterations in appearance which change the boy of today into the man of tomorrow. This natural change puts something into the appearance of the mouth which no orthodontic appliance can put there. Nature is an artist; we are mechanics.

This thought is further brought home when we view the sorry results of another supposed short cut to early completion of cases. I refer to extractions. No one who has an eye with which to see can have failed to note the ruination of many faces by the extraction of teeth as an orthodontic procedure. When we see orthodontia in terms of the whole individual and not simply as a mechanical operation in the mouth, this pernicious practice will cease.

A fourth cause of failure is an outgrowth of the other errors in treatment. I refer to retainers. I have always condemned this practice, and I continue to condemn it. Of course, when rapid treatment and continuous treatment are used, correlation of development of the tissues cannot occur; and, when appliances are removed, relapse occurs. In an effort to prevent this relapse, orthodontists resort to the use of retainers. The teeth cannot perform their full function when held by retainers, and the inevitable disappointment is only delayed. Worse than this, permanent damage may be done to the tissues of the oral cavity.

Orthodontists claim that they merely hold the teeth in positions in which they belong. Who of us knows enough of the periods of growth and the directions of growth to say where teeth belong? They belong in positions which they will find eventually for themselves, retainers or no retainers. We do not have the last word in orthodontia: Nature has it. Our only excuse for being is that, with care, we can eliminate factors which are interfering with natural development. We cannot work toward a definite end. We can only remove obstacles and then allow natural development to follow through to maturity. If orthodontists grasped this fact, they would not begin treatment whenever a patient arrived and continue treatment without interruption until a premature completion and the insertion of retainers. They would, with infinite care, help Nature only during those periods when the most benefit and the least harm would result.

I have discussed the inherent defects in structure which make us fall short of our goal of normal occlusion. I have discussed certain errors in treatment which bring about unfavorable results.

There is a third factor, unknown today, which brings about failures. It is probably the result of abnormal variations in the developmental processes of growth, but beyond that we know nothing. Let me illustrate:

A number of years ago I had as patients a brother and a sister, one twenty and the other twenty-one years of age. At this period both began to develop into Class III malocclusions. The mandibular anterior teeth bit well outside the maxillary teeth with the expected relationship of the molars. Both arches were well developed. I treated them at the same time in the same way with intermaxillary elastics. I established a very good occlusion and a well-balanced

face for the girl, and it remains today after nearly twenty years. The occlusal relations of the boy were equally good, but while that remained the mandible continued to enlarge and the point of it developed to such an extent that the man has a very definite appearance of Class III malocclusion. This would seem to be one of Nature's failures over which we have no power.

The influence of unknown developmental forces is illustrated by the history of four children, two in two different families. The history of one is repeated in the others. Treatment was begun at the usual time and was apparently finished when, at the age of sixteen or seventeen years, the mandible began to protrude and the mouth started to open. The face seemed to lengthen, and there seemed to be a very definite bending of the mandible beginning at the region of the bicuspid teeth. I was never able to correct this condition for any of the four children. Was this faulty manipulation of appliances or was it something in the organism over which we, at present, have no control?

In summation I would say that while many failures are directly attributable to errors in treatment, there are others which appear destined to failure under any kind of treatment or without any treatment. Certain steps, because of their compatibility with the developmental processes in growth, are more likely to lead to success. Other procedures, because they run counter to natural development, are more likely to lead to failure. But, when unknown forces interfere with natural development, failure results, and we do not today know the reason. Because growth is something which we cannot see, many assume that it goes on very smoothly and uniformly, in spite of the fact that we see so many variations as the result of the variations in growth. We see thousands of variations, and they are merely the visible expression of unseen causative variations, far more numerous.

There is no standard for measuring success or failure and all the variations between the two extremes. To one orthodontist a case is a failure, while to another the same case would be satisfactory. Perfection, as a goal, is beyond the realm of human possibility. We may aspire to normal occlusion except in cases in which variations from the normal, in structure, make the achievement of anything beyond good function impossible. In such cases the only failure is on the part of Nature in not properly balancing the amount of tooth material, the length of the muscles, or some other important factor.

With so many discrepancies in development and such a wide variation in response to treatment, and with only one weapon at our command and that a dangerous one—orthodontic appliances for the purpose of applying force—the wonder is that failures do not occur more frequently!

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FAILURES IN ORTHODONTIC TREATMENT*

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THE invitation to take part in a symposium on failures in orthodontic treatment confused me at first. I did not know just how to take it. There was something about it which made me apprehensive that such a distinction may be due to some outstanding achievements of this particular kind. But when I was assured that Dr. Rogers and Dr. Mershon were to be the other participants, my fears were somewhat allayed, though not altogether banished. What is bothering me now are the various implications to which discussions on such a topic might lead. It would perhaps be no exaggeration to imagine that what might be expected under such circumstances is a complete confession of all my sins. From the viewpoint of other sinners this would be quite agreeable and perhaps very gratifying, since, as it is said, misery loves company. Considered, however, from the viewpoint of the end to be gained, such a confession is liable to have undesirable consequences. Thus, failures frankly admitted but without a definite aim might be taken as an encouragement to those who happen to have an inordinate number to their credit. Or one might be led to the inference that, since the most expert of us are not entirely free from them, failures in orthodontic treatment are unavoidable. Taken either way, the result would be disastrous. Besides, I really have no confessions to make, because failures, like successes in orthodontic treatment, as I look at them, do not represent definite or stable end-results. They are both transitory stages brought about by artificial means and are subject to further changes which cannot be satisfactorily controlled by the customary procedures. Moreover, there is really nothing to brag about either. We have as yet to justify what we are actually doing. I am not so sure that in attempting to correct one thing we are not upsetting many other things. Careful studies of actual cases warrant the suspicion that the profession has as yet failed to take notice of or is entirely ignoring the changes taking place subsequent to the completion of orthodontic treatment.

What the objective was in choosing this topic I do not know, but I am quite certain that a proper approach to it and a departure from it may not turn out to be just what was originally expected. This for various reasons. Failures, like successes, it seems, are taken for granted. In fact, to be frank, it often looks as though orthodontia as a whole is taken for granted. Evidence derived from extensive investigations of a large variety of results of treatment supports the view that this attitude is closely linked to the failure to realize that orthodontia is a problem, the solution of which is as yet still wanting. Of course,

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this may be beside the point, but if we expect to get anywhere now, we must learn to understand that the concept of failure will not be clear until it is treated as part of the general concept of orthodontia.

Failure in general is defined as anything done imperfectly or attempted unsuccessfully (Funk and Wagnalls' New Dictionary). The question is: Can such concept of failure be applied to misadventures in orthodontia? Some may answer in the affirmative, others in the negative. In either case the answer must of necessity rest on the understanding of the problem which orthodontia presents to each of us. There has always been a division of opinion on this point. On the one hand, there are those who still hold that the problem in orthodontia is chiefly concerned with the choice of appliance to be used or with the mechanical procedure entailed in the treatment of malocclusion of the teeth. From this point of view it is quite simple and also logical to assume that *missing the attainment of the end aimed for in the treatment of a case constitutes a failure.* On the other hand, there are those who hold that the problem in orthodontia is considerably more complex and very much more profound. This view is supported by the evidence of important facts already familiar to most of us. It has, for instance, been observed that at birth malrelationships of the jaws among European whites appear to the extent of 30 per cent of newborn infants (Clinch[1]). With the appearance of the deciduous teeth the situation is not changed. The ratio of normal to abnormal in relationship of the jaws among American whites is the same,* but at this stage the actual occlusion of the teeth in the deciduous series is added. During the period covered by the shedding of the deciduous and the eruption of the permanent series occlusal disturbances increase to the enormous proportion of 70 per cent in the adult.* It is thus obvious that the relationship of the jaws, the occlusion of the teeth, and the malocclusal disturbances are bound up with other events transpiring in the course of growing up. In other words, during the interval from infancy to adulthood, there is besides the 30 per cent malrelationship of the jaws which is congenital in origin, an additional 40 per cent depreciation of the occlusion of the teeth which may be attributed to environmental conditions. Since this depreciation occurs simultaneously with the changes concerned in the transformation of the infant dentition to that of the adult, it is fair to assume that the problem of occlusion is essentially a part of the problem of development. Moreover, if, as it is held, occlusion is the foundation of the functional efficiency of the dentition, then the problem of orthodontia rests on three fundamental needs:

1. The need of that knowledge which has for its object the discrimination and recognition of those phases of development having a direct influence upon: (a) the eruption and shedding of the deciduous teeth and the eruption of the permanent teeth; (b) the establishment of the alveolar and dental arches; and (c) the development of the jaw bones as well as of the entire face.

2. The need of that knowledge which has for its object the application of natural means (physiologic, or biologic, if you prefer) to promote the effects which are favorable and intercept or eliminate those which are unfavorable to developmental progress.

*Unpublished data of Hellman.

3. The need of that knowledge, ability, and skill which have for their object the proper use and expert manipulation of those mechanical devices which are most expedient and of greatest benefit in routine practice when actual treatment cannot be averted.

Considered from this point of view, failures in orthodontic treatment assume an entirely different and considerably varied aspect. There are thus failures of such variety and extent as may be grouped under six general captions:

1. Failures due to lack of appraisal of developmental progress.

2. Failures due to neglect of distinguishing between favorable and unfavorable trends in the development of the dentition.

3. Failures due to improper decisions of the actual need for orthodontic treatment in borderline cases.

4. Failures due to inappropriate timing of the introduction of the mechanical procedure, when the teeth are definitely in malocclusion and treatment is indicated.

5. Failures due to inability to carry out successfully the measures employed.

6. Failures due to unfavorable changes which follow successfully treated cases.

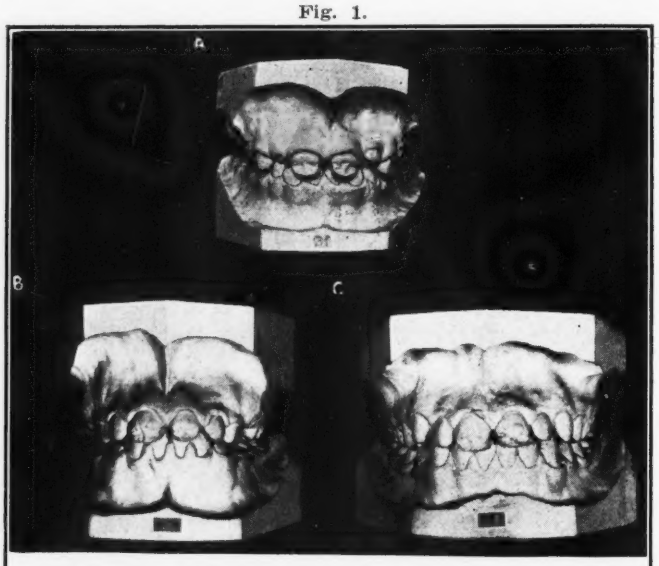
Of course, each of these groups may be further subdivided into several categories in accordance with certain special and characteristic features in each case and the difficulties encountered in treatment. Since the allotted time will not permit a more detailed account, I shall deal only with the facts of the major divisions of failures, leaving the details for some future occasion.

1. Failures due to lack of appraisal of developmental progress are perhaps the most prolific in orthodontic ventures. For example, few of us are unacquainted with the space (diastema) between the maxillary central incisors soon after they have erupted. The first impulse of the orthodontist is to attribute it to a cause and then recommend the removal of the cause as a remedy. Of course, as you all know, when such a space confronts the orthodontist, the immediate reaction is to blame the frenum labia. The removal of the frenum therefore is, in the opinion of many, the proper procedure in such contingencies and pulling the incisors together the remedy. In cases which I know to have been thus treated, the elimination of the space is usually a failure.

In Fig. 1 *A*, for instance, is shown a sample of it. This patient was referred to me for further care after the frenum was removed by electrocautery and after the maxillary central incisors had been brought together. Each of the central incisors had a band with a labial staple. A link made of fine spring wire slipped through the staple held the teeth together. I maintained this retention for a year, but soon after the removal of the bands the teeth began to spread apart, Fig. 1 *B*. I repeated the operation of bringing and keeping the incisors together with the subsequent result shown in Fig. 1 *C*. The space between the central incisors, though somewhat reduced, is still patent. It seemed to me that all this fussing and tinkering in such cases is useless. When similar cases appear in my practice I treat them differently. Thus the case shown in Fig. 2 *A* presents the dentition of a girl seven and a half years of age, and Fig. 2 *C* a girl seven years

of age. Both cases are at the same stage of development as that shown in Fig. 1 *A*. As I interpreted this condition, it is a stage in development the progress of which should not be tampered with. So I left them alone, but I watched for further events. In the course of time the decision proved to be correct and the outcome favorable. Fig. 2 *B* and *D*, showing the dentitions of the same girls

Fig. 1.



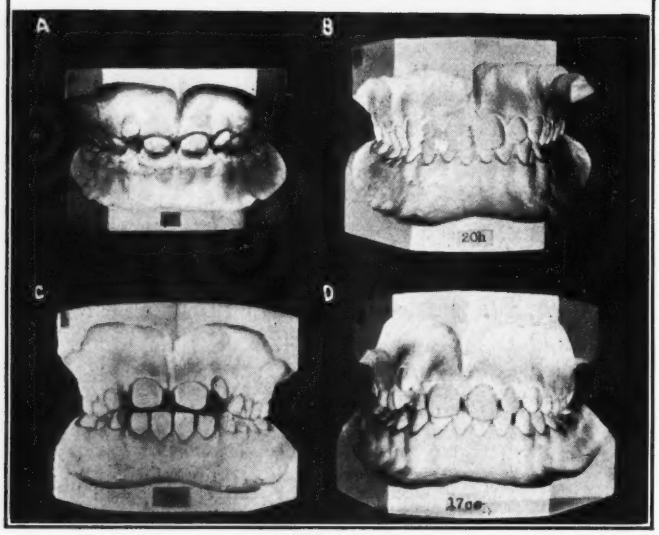


Fig. 2.

Fig. 1.—Cast of the dentition of boy, showing failure in closing space between maxillary central incisors: *A*, at beginning of treatment (February, 1910); *B*, shortly after the teeth were brought together and retained for a year (Dec. 30, 1912); *C*, shortly after a second repetition of the procedure (Sept. 20, 1915).

Fig. 2.—Casts of the dentition of two girls, showing spaces between maxillary central incisors. The stage of dental development in both is the same as in Fig. 1. *A* and *C*, at the beginning of observation; *B* and *D*, at the end. The spaces closed naturally without orthodontic help. In *D* the incisor occlusion also improved.

at sixteen (*B*) and ten (*D*) years of age, respectively, shows the successful results of my failure to resort to the accepted traditional procedure. The natural improvement in occlusion of the incisors in the case of Fig. 2 *C* and *D* might in this connection also be of interest.

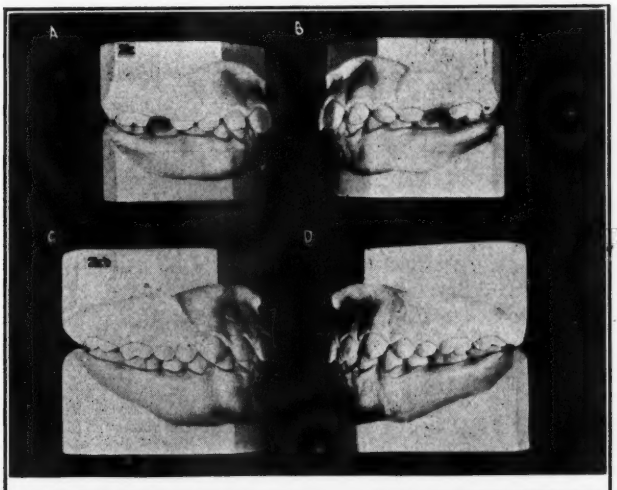


Fig. 3.

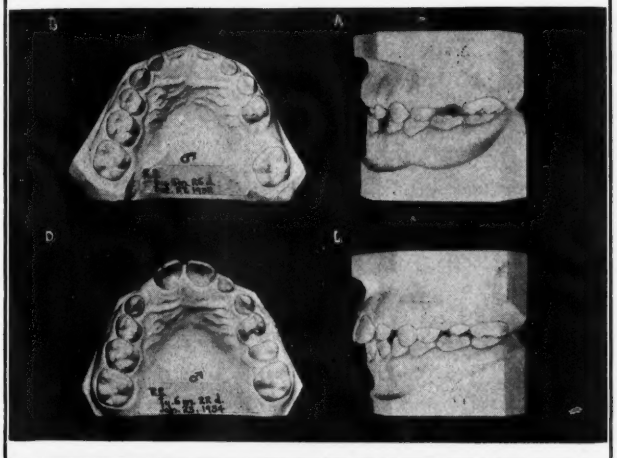


Fig. 4.

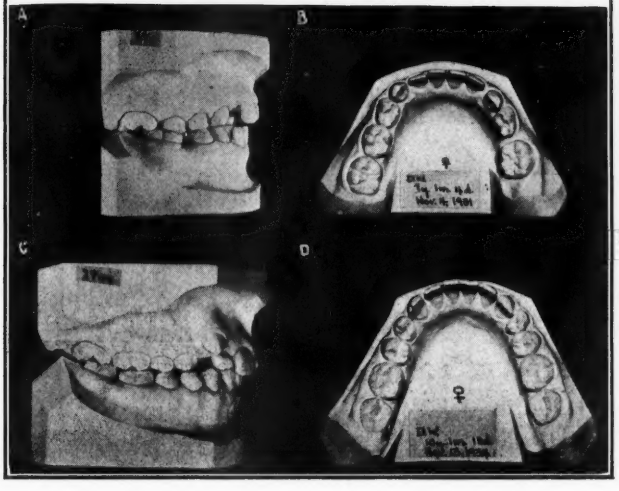


Fig. 5.

Fig. 3.—Casts of the dentition of a boy at eight years of age, showing premature loss of maxillary second deciduous molars. *A* and *B*, no space maintainers were used; *C* and *D*, three years later, the second premolars are in place and the dentition is in normal occlusion.

Fig. 4.—Casts of dentition of boy six and a half years of age, showing *A*, left side view; and *B*, occlusal view of maxillary dental arch. Maxillary left deciduous second molar prematurely lost, no space maintainer used. *C* and *D*, dentition one year later, maxillary second premolar erupting and taking its proper place.

Fig. 5.—Casts of the dentition of a girl seven years of age: *A*, right side view; *B*, occlusal view of mandibular dental arch, showing loss of mandibular right second deciduous molar with space closed. No orthodontic treatment. *C* and *D*, same dentition three years later, mandibular second premolar erupted, teeth in proper position and the dental arch in normal shape.

2. Failures due to neglect of distinguishing between favorable and unfavorable trends in the development of the dentition are at the present time causing more confusion among dentists than any other misunderstood feature in orthodontia. The orthodontists now appearing on dental programs seem to be so obsessed by the importance of space maintainers and the dentists so impressed by it that no program of any dental meeting is complete without a paper on this subject. Evidence derived from cases in my practice fails to prove a real cause for all this needless excitement. In the case, for example, illustrated in Fig. 3 *A* and *B*, the dentition of a boy eight years of age is shown in which both maxillary deciduous second molars were lost (by extraction) prematurely. According to available knowledge, these teeth were lost three and a half years before the scheduled time for their shedding.[2] Does this mean that the space for the second premolar will have to be "maintained" for that length of time? By no means. In spite of the fact that I used *no* space maintainers, three years later, as shown in Fig. 3 *B* and *C*, the premolars had erupted and taken their proper places, and the dentition as seen in the illustration is in normal occlusion. Also, in younger children this sort of occurrence may be treated in the same way. In Fig. 4 *A* and *B* is shown the dentition of a boy only six and a half years of age. The maxillary left deciduous second molar had been extracted. This boy would, accordingly, have had to wait five and a half years for the permanent successor to fill the gap. But we forget that Nature does not act that way. When an emergency arises, Nature is liable to violate rules and meet the situation satisfactorily. One year later, as shown in Fig. 4 *C* and *D*, the upper left second premolar was erupting and taking its proper place. But even in cases in which the space of a lost deciduous tooth is closed up, it is not always safe to argue that the damage is serious and that if space maintainers had been used it would not have happened. In the case shown in Fig. 5 *A* and *B*, presenting the dentition of a girl seven years of age, the mandibular right second deciduous molar was extracted and its space is completely closed. If, as is generally advocated, there is such great need for space maintainers to hold on to widely open spaces, how much greater would be the immediate need in this case for a space opener? In this, as in the preceding cases, nothing but watchful waiting was resorted to. The result three years later, as shown in Fig. 5 *C* and *D*, proves that the failure to resort to mechanical procedure turned out quite satisfactorily. The point to be made is that the introduction of space maintainers and space openers in cases of this sort bears evidence of our failure to distinguish correctly between favorable and unfavorable trends in the development of the dentition. Even if such mechanical devices as are represented by space maintainers do not happen to interfere with the natural course of events, it does not prove that they are necessary.

3. Failures due to improper decision of the actual need of orthodontic treatment in borderline cases are more abundant than one would be willing to admit. In my estimation, cases of this kind are more baffling than the problems represented by more marked cases of malocclusion. When thoughtlessly gotten into, they are aimlessly conducted and uselessly treated. The final outcome, if satisfactory, is just about what was started with. Of course, like other

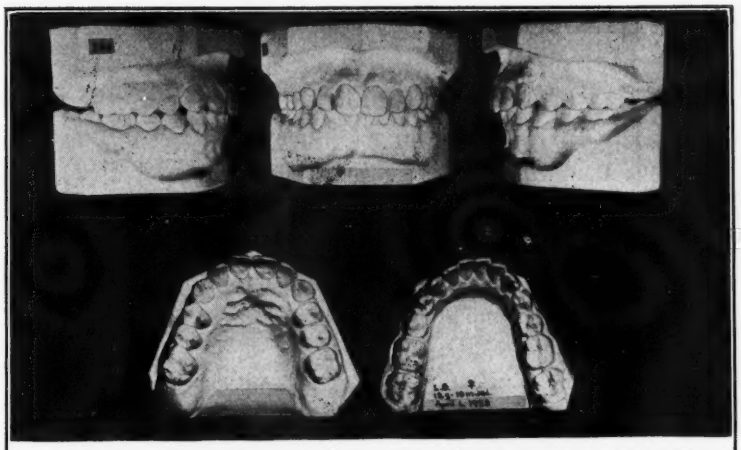


Fig. 6.

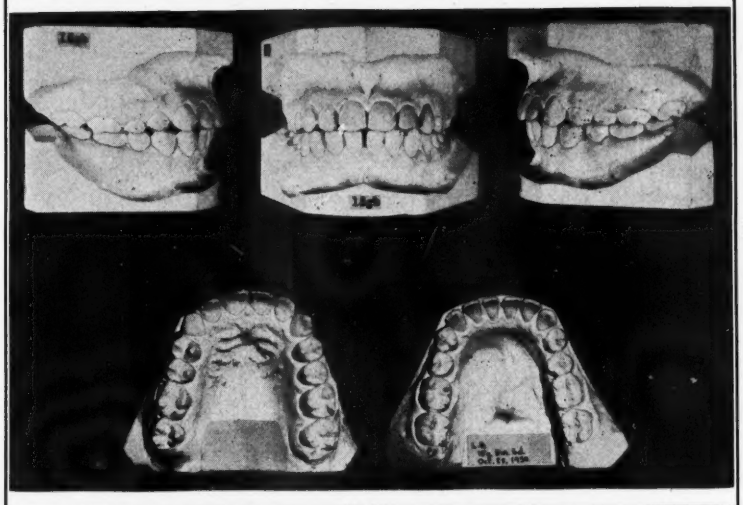


Fig. 7.

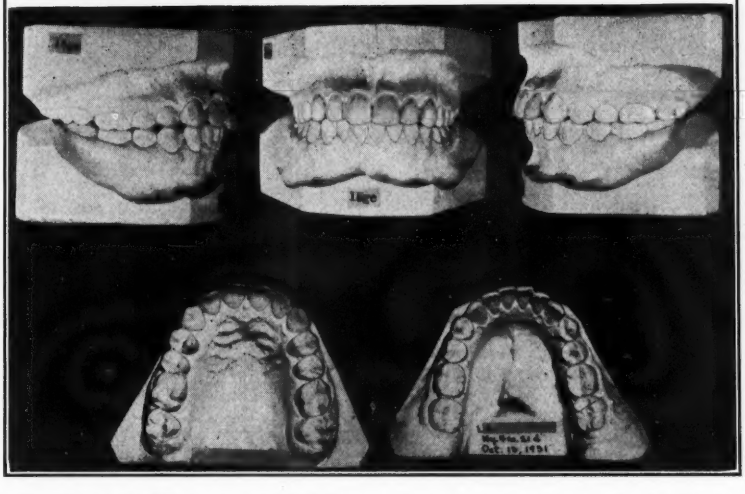


Fig. 8.

Fig. 6.—Casts of dentition of girl thirteen years of age before orthodontic treatment.
Fig. 7.—Condition after two and a half years of orthodontic treatment.
Fig. 8.—Condition one year after removal of the appliances.

reasons for differences, a good many orthodontists may find sufficient reason to differ as to the actual need of orthodontic treatment in the case shown in Fig. 6. The orthodontist concerned in this case decided in the affirmative. After two and a half years of strenuous and continuous treatment, the result obtained is shown in Fig. 7. Is this a success or a failure? Taking into account the form of the dental arches attained in Fig. 7, the spaces created between the teeth and the occlusion established, it should not be difficult to determine that this is a failure. The patient was at this point referred to me for further care. But what can be done at this stage of the game? It was my firm conviction that the original state of the dentition was far better than the one obtained. I so informed the parents and the appliances were removed. One year later, the dentition was as shown in Fig. 8. I am of the opinion that my failure in dispensing with further treatment is more successful than the success of the previous treatment. The point is that this case illustrates the fact that failure and success are so closely interwoven as to demand the most discriminating judgment in the decision of what is best for the patient.

4. Failures due to inappropriate timing for the introduction of mechanical procedures when the teeth are definitely in malocclusion and treatment is indicated are perhaps the most distressing of all orthodontic evils. Because of our ability to do, and because of the inference that the earlier that treatment is started the better it is, we are often liable to, and many actually do, start orthodontic treatment too early. The inevitable result is an inordinately long period of treatment, overworked teeth and surrounding tissues, sometimes the onset of caries and often mechanical abrasion, unfavorable physiologic conditions, and obscure psychologic disturbances. What is most distressing is that when treatment is started too early, the orthodontic results are never satisfactory. Those who have had experiences of this sort and have learned from their experiences are familiar with the nature of such ventures. There is nothing to say or do about it. It is best not to be led into it and next best to stop when one realizes what one has gotten into. In Fig. 9 is shown the dentition of a girl three and a half years of age. All will agree that there is a definite malocclusion of this dentition. All may not agree to the treatment of this case at this time. I for one do not. But this case was started, and, as shown in Fig. 10, presenting the dentition of the same girl seven and one-half years later, she is still under treatment and going strong. But will she ever get there? Many more samples of this sort are available and could be shown but this one will quite do.

5. Failures due to inability to carry out successfully the measures indicated are perhaps the most numerous in orthodontia. If I am not misjudging the reason for my presence here today, it is because of the frequency of this sort of failure. In my estimation, this group of failures should be the least if the skill and proficiency of the orthodontist are what they are cracked up to be and if the treatment of a case is exclusively dependent upon them alone. A failure belonging in this group is shown in Fig. 11. The boy whose dentition is shown in this figure came to me for consultation, but was taken to some one else for

treatment. He wore "braces" for four years. When the parents realized that he was not getting anywhere, the boy was brought back to me. The dentition at this time looked as shown in Fig. 12. There is no doubt that this is a failure, but is it according to the definition "imperfectly done or unsuccessfully attempted"? As I see it, it is just worse than it was, because, in addition to the original malocclusion, the maxillary first molars which at the start were in correct labiolingual occlusion were pushed entirely out of place. The patient or cir-

Fig. 9.

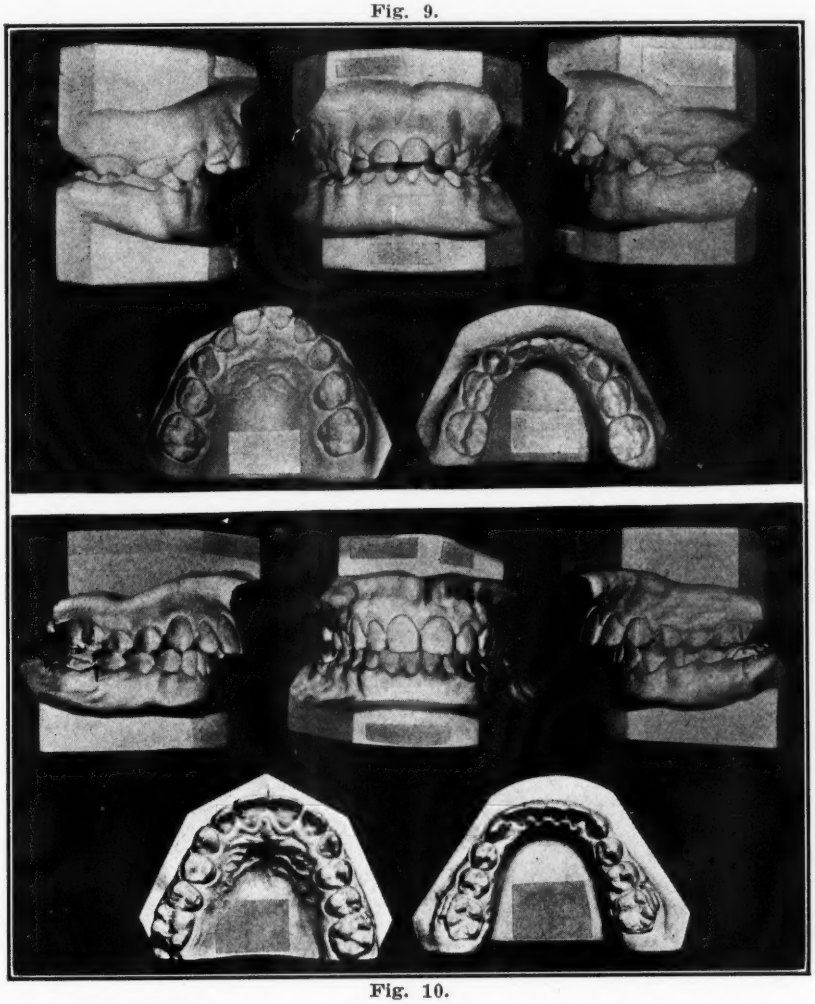


Fig. 10.

Fig. 9.—Casts of dentition of a girl three and a half years old, showing Class II, Div. 1 malocclusion before orthodontic treatment.

Fig. 10.—Condition of dentition after seven and a half years of orthodontic treatment.

cumstances could not be blamed for it, because under proper subsequent treatment the result shown in Fig. 13 was obtained. In such failures nothing but indignation is in order, as there is no excuse for it besides ignorance and incompetence.

6. Failures due to unfavorable changes which follow successfully treated cases are the most interesting and offer the most fertile field for research in orthodontia. Unfortunately, the material for such studies is not very abundant

Fig. 11.

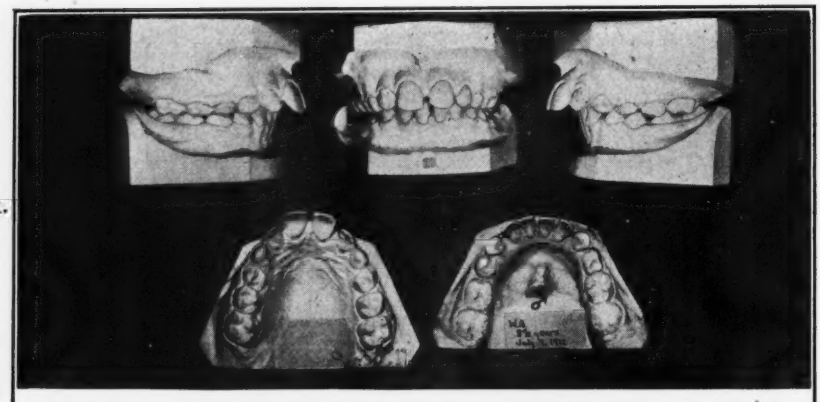


Fig. 12.

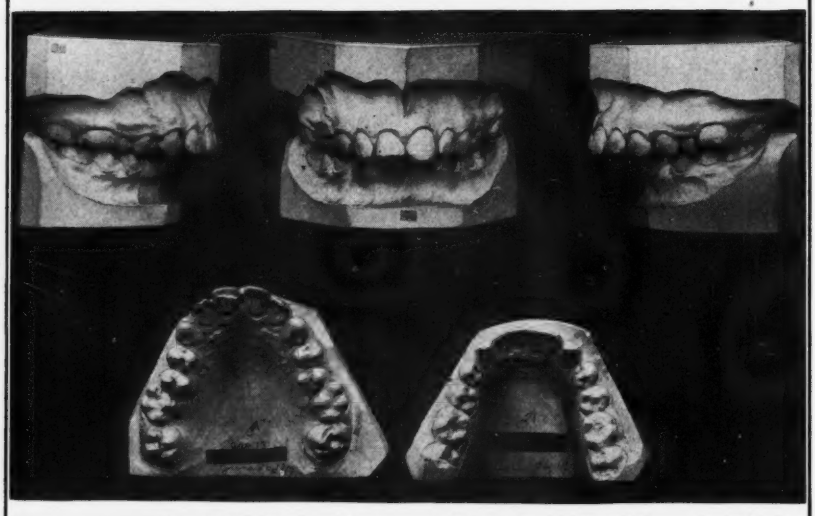


Fig. 13.

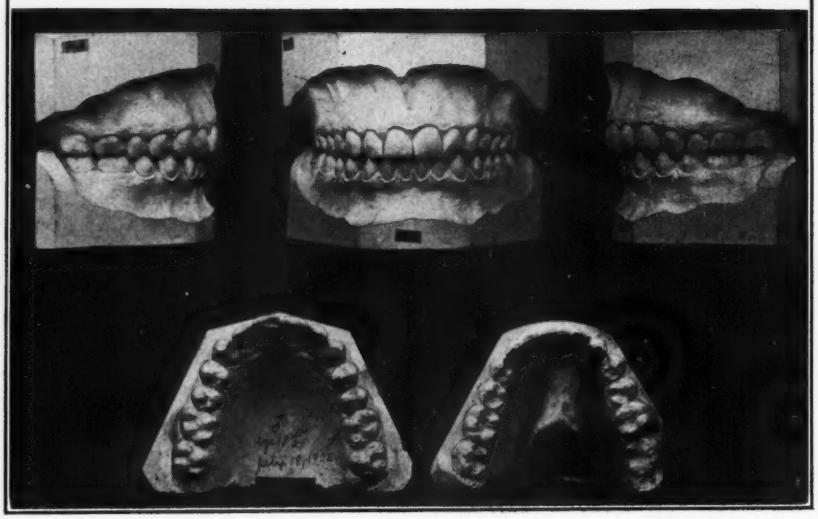


Fig. 11.—Casts of dentition of a boy eight and a half years old, showing Class II, Div. 1 malocclusion before orthodontic treatment.

Fig. 12.—Condition after five years of orthodontic treatment.

Fig. 13.—Successful result of orthodontic treatment.

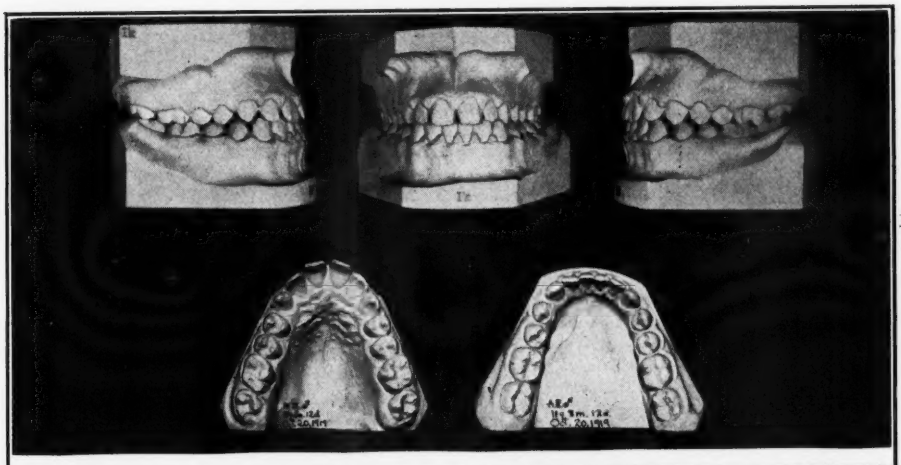


Fig. 14.

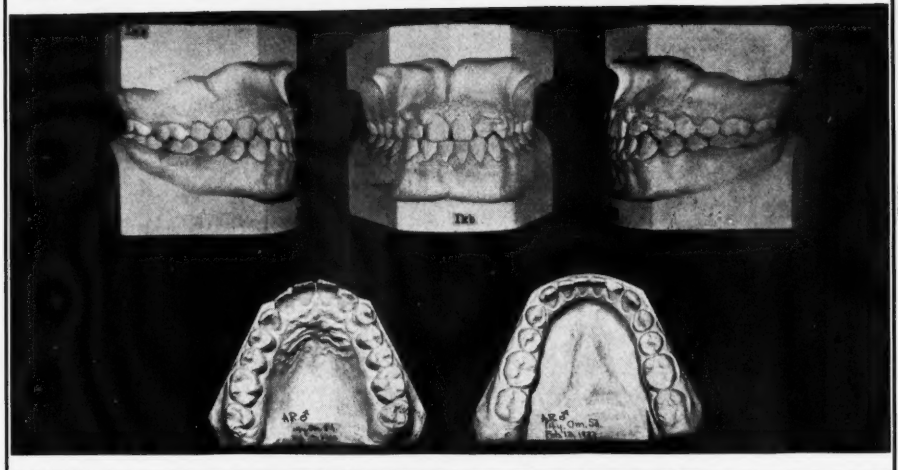


Fig. 15.

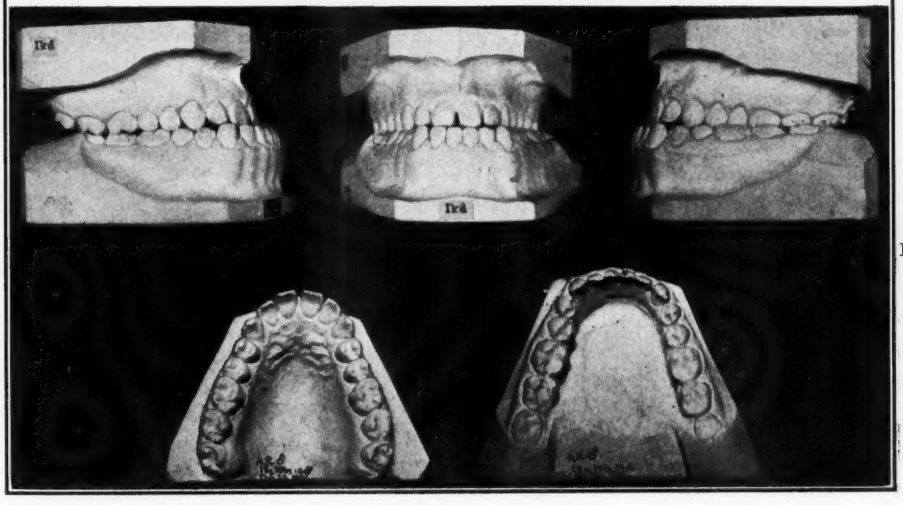


Fig. 16.

Fig. 14.—Casts of dentition of a boy eleven years eight months old, showing condition before orthodontic treatment; Class I with tendency to Class III.

Fig. 15.—Two years later, showing successful result of orthodontic treatment.

Fig. 16.—Five years later, showing condition brought about by growth changes subsequent to orthodontic treatment.

Fig. 17.

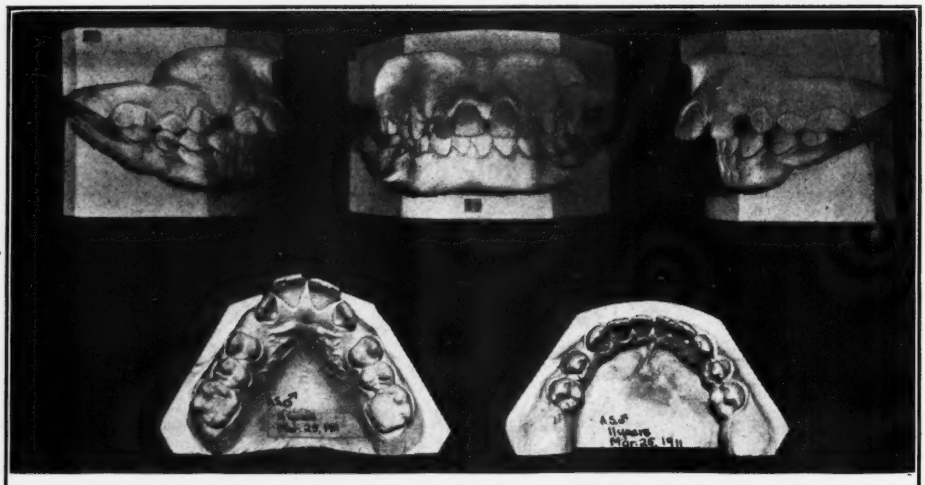


Fig. 18.

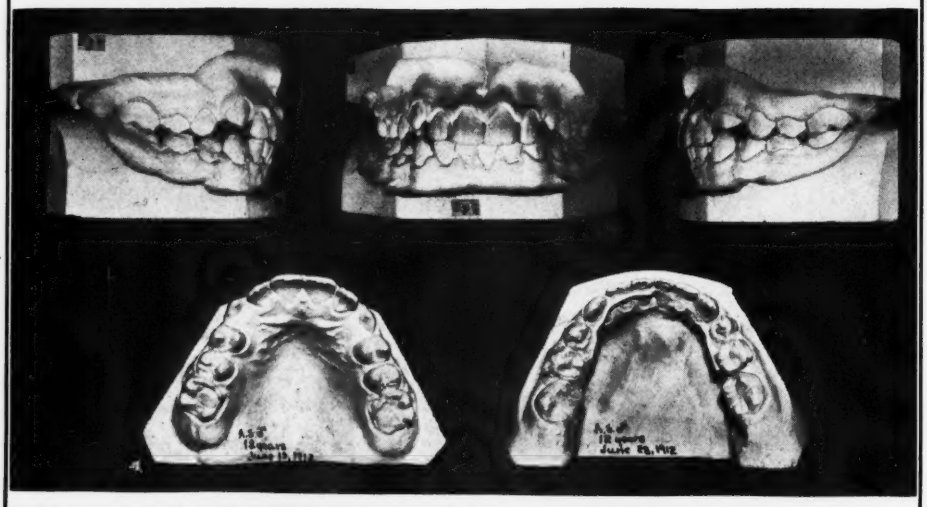


Fig. 19.

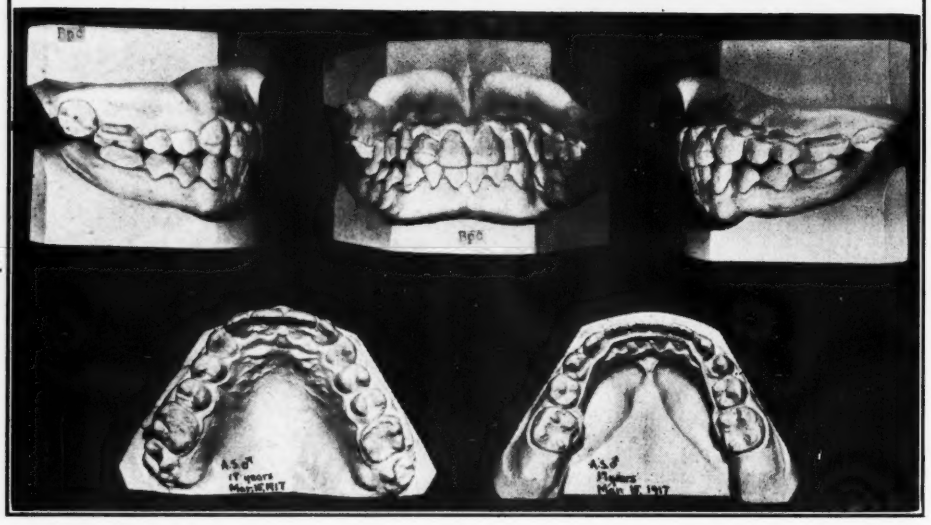


Fig. 17.—Casts of dentition of a boy eleven years of age, showing Class II, Div. 1 malocclusion. Note absence of mandibular first molars and close spaces of maxillary canines.

Fig. 18.—Condition after one year of orthodontic treatment. Retainer in place and mandibular second molars erupted.

Fig. 19.—Condition after five years of treatment and retention. Maxillary second permanent molars erupted, but no occlusal antagonist present in mandible.

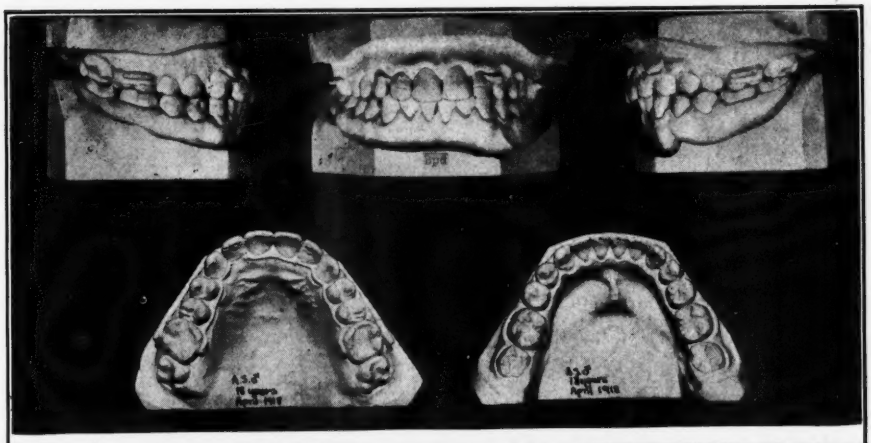


Fig. 20.

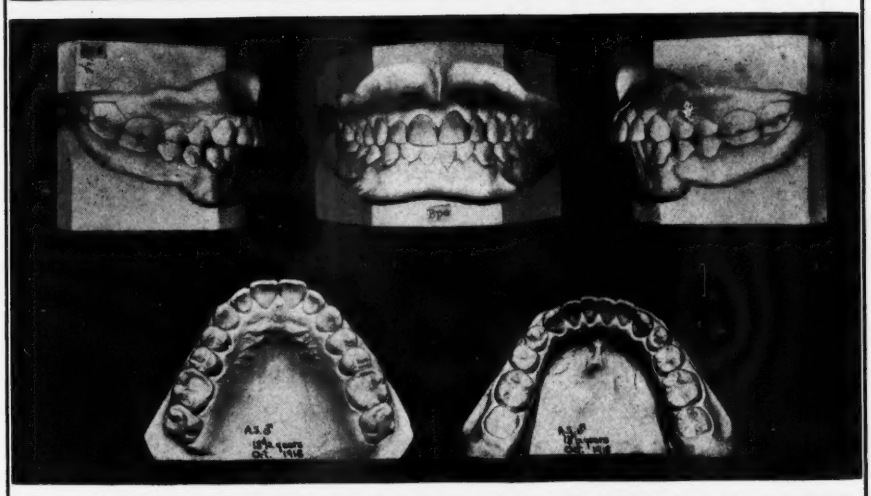


Fig. 21.

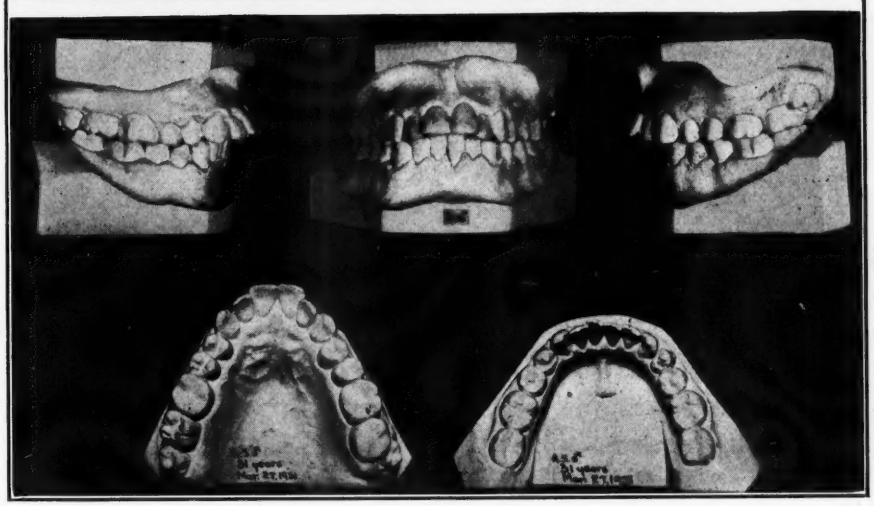


Fig. 22.

Fig. 20.—One year later. Retention still in place, mandibular third molars erupted and occluding with maxillary second molars.

Fig. 21.—Seven months after removal of retaining appliances, showing drift of occlusion to Class II.

Fig. 22.—Thirteen years later, showing complete relapse to Class II, Div. 1 as in Fig. 17. Maxillary third molars erupted with no occlusal antagonists in mandible.

because sustained interest in what we fail to accomplish is not remunerative. I have made an effort to collect such records, and up to date I have almost as adequate a collection of casts of failures of this nature as I have of successes. Two samples of this class of failures will be shown now to demonstrate the intricacy of the real problem confronting the orthodontist. In Fig. 14 are shown the casts of a boy twelve years of age. The occlusion, according to the Angle classification, was really Class I, but it was drifting into Class III. The maxillary left lateral incisor was in linguoclusion, the mandibular left canine in labioclusion, and there were spaces between several of the teeth. There were no unusual difficulties encountered in treatment. The tendency toward Class III was overcome and the result was a success. Fig. 15 shows the casts of the boy two years later. But five years after, at nineteen years of age, the dentition of this boy appeared as shown in Fig. 16. At this time, as will be noticed, it is as complete a Class III case as any that has ever been shown. If there is any doubt about changes taking place after the completion of orthodontic treatment, this sort of evidence should suffice to dispel it. What happened is a question to be discussed at a more opportune time. The fact that it happened should suffice for the present. Another case of this kind was reported in a paper previously published.[3]

In contrast to this case, I will show you another failure of a different type. In Fig. 17 is shown the dentition of a boy eleven years of age. As may be noted in this figure, the malocclusion is of the Class II, Division 1 type. The mandibular first permanent molars were lost, and the spaces for the maxillary unerupted canines are partly closed. The treatment was not unusual, except that the so-called anchor bands in the mandible, because of the absence of the first molars, were placed on the second premolars. In one year the result obtained is shown in Fig. 18. At this point I should have stopped, but I was not quite satisfied with the position of the mandibular second molars which had erupted in the meantime. They were tilted forward and inward, and had rotated mesiolingually. Those who hold that the mandibular second or third molars come into proper position when the tooth in front of them is extracted should pay particular attention to the position of the mandibular second molars in this case. Anyway, neither the position nor the outcome satisfied me, so I tried to improve the situation.

According to Angle, all teeth displaced by extractions should be put into proper position and space for the extracted teeth should be reestablished and filled with artificial substitutes. I did not take this seriously enough. After trying it, however, I found it very difficult and thought it really needless. So I just corrected the position of the mandibular second molars and in approximately five years spent in doing it and retaining the results obtained, the dentition, as shown in Fig. 19, was in normal occlusion. Everything looked fine, but the maxillary second molars which were at this time fully erupted had no antagonists with which to occlude. I maintained the retention for another year, when the mandibular third molars had erupted and were in occlusion with the maxillary second molars, Fig. 20. So far so good. At this time I felt it quite safe to dispense with the retaining appliances. The boy really deserved it after

seven years of annoyance. Six months later I took impressions, the casts of which are shown in Fig. 21. Both the young man and I agreed without further argument that the matter was not quite right, but both of us were willing to let it go at that. We parted as friends. The proof of it is shown in the last illustration, when the young man dropped in to see me on a friendly visit in 1931, thirteen years after I had last seen him. I took advantage of this opportunity to take impressions, the casts of which are shown in Fig. 22. As seen in this figure, the dentition has drifted into a complete Class II, Div. 1 case with all the earmarks of the original condition.

Whatever may be the explanation of these last two failures, the fact remains that both were brought about by growth changes which occurred after the orthodontic job was successfully finished. The important thing, however, for us to know is that evidence derived from other investigations and from studies of many such cases indicates that growth changes, wherever they happen to appear, are not uniform. For example, growth of the face is independent of that of the brain case, and different parts of the face grow independently of each other. The differences in the failures of these two cases demonstrate the lack of uniformity in growth of the jaws. In the one the growth of the mandible was too much; in the other not enough. What is of particular significance is the fact that manifestations of growth changes are not always alike and do not always occur at the same time. Sometimes the changes are scarcely discernible, and at other times they appear in veritable outbursts. Sometimes they occur early, sometimes late in the stretch of time it takes to grow up. Boys, for instance, always show a spurt in facial growth, particularly in the mandible, at the period of adolescence.

Viewed from this point it becomes a matter for serious thought to reconcile the knowledge derived from scientific researches in growth with the clamor of those orthodontists who advocate early treatment. That we are actually facing such a problem is amply demonstrated by those who have learned to repeat and speak glibly about growth and development, but who have not the slightest idea of what to do with it. They are as yet oblivious to the fact that the value of knowledge rests on the use to which it can be put. To say one thing and do the opposite proves the lack of understanding of what is said. If we are to make any headway, it is about time to stop all idle talk which has so far led to confusion and failures, and learn to recognize those fundamental principles upon which scientific orthodontia is bound to be built. What I mean by scientific orthodontia is that kind of knowledge which can be applied for practical purposes. Using the scientific method for orthodontic purposes, then failures can be foreseen and should be avoided. Our choice must be made between continuing the endless repetition of the confusing and misleading nonsense from the past and improving our present knowledge through the information gathered from the treasures of orthodontic collections already at hand. The justification and significance of orthodontia, as it is to be handed down to posterity, will depend not upon the game of "follow the leader," but upon what every one of us will do to reenforce the foundation which is being laid down now. To this end no other material is of greater value than the priceless collections of

orthodontic cases comprising successes as well as failures. Studies are now being vigorously pursued and will be reported as warranted by progress and permitted by opportunity.

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DISCUSSION ON SYMPOSIUM: FAILURES IN ORTHODONTIC TREATMENT

Dr. S. Lewis Kregerman.—In reference to the last case Dr. Hellman showed, if he were to treat that case today, would it occur to him possibly to extract the maxillary second molars to harmonize with the mandibular teeth, or would he still persist in treating it the way he did? I mean would he give consideration to the extracting of second molars?

Dr. Hellman.—No.

Dr. Goldsmith.—How about the third molars after he got through with the treatment?

Dr. Hellman.—The third molars have nothing to do with the paper.

Dr. Goldsmith.—You would not extract them?

Dr. Hellman.—No.

Dr. Waugh.—I think we have been extremely fortunate in hearing three fine presentations, all of which are most valuable and individually valuable in proportion as we are able to interpret them. On each one of them, without nice interpretation, I think we would be inclined to disagree.

I ask one question in regard to the case that has already been questioned. In that last case to what extent does Dr. Hellman weigh heredity as the dominant factor in the failure as compared with acquired tendencies?

Dr. Hellman.—I weighed the fact of heredity in this case as in any other case.

Dr. Howe.—I should like to ask Dr. Hellman, if he were to treat this case again, how he would proceed.

Dr. Hellman.—I would have to go into too extensive detail. If you will give me an opportunity for a couple of hours to do that, I shall be glad to answer the question.

President Blumenthal.—Dr. Waugh, did you want further discussion on your question?

Dr. Waugh.—I do not know whether Dr. Hellman understood my question rightly. In such cases as this, where there is a very strong tendency to relapse after a nice result is obtained, my observation is that if we go back into the history of the parents we more than likely find similar conditions in their mouths, and that the hereditary influence was the factor which created the failure; whereas if I had a failure in a case of this sort where both of the parents had more or less normal dental arches, then I should think it was due to an acquired tendency, and that I, personally, was much more to blame for my inability to obtain a good result than in the case in which a hereditary influence dominates such conditions. I think that is the essential point we should learn: what there is back of the individual; in other words, I think it is a wise child who chooses very, very fine grandparents.

Dr. Stilson.—If the question is in order, I should like to ask Dr. Hellman if good strong lip action could have been developed there, normal action, would that have changed the result? Judging from the final results, the patient was a mouth-breather, with almost no good function.

Dr. Hellman.—Very probably, Dr. Stilson.

Dr. Kelsey.—I did not intend to enter this discussion, but I am led to by one or two things that were presented during the symposium.

I mistook the first part of Dr. Mershon's paper not as a plea for a compromise treatment when it became evident that it was necessary, but at least the approval of adopting a compromise when conditions forced you to do so or leave the patient in the unfortunate position that was presented by Dr. Hellman's last case.

Then Dr. Mershon stated that no extraction under any circumstances was allowable, so evidently I interpret his paper incorrectly; in other words, I make different interpretations from the substance of his paper than he does himself. Some of the statements he made in the first half of his paper and some of the statements that Dr. Hellman made would have corroborated my own belief that in the last case which Dr. Hellman showed it would have been far better to have compromised with a condition that the patient was not responsible for, Dr. Hellman was not responsible for, and Nature was not responsible for. This patient, if I understand it correctly, had lost two mandibular first molars. It seems to me evident that Dr. Hellman had a beautiful result with the maxillary first molars occluding with the mandibular second. If at that time he had foreseen what inevitably must happen, and what did happen, and had taken out either the maxillary second molar or third molar, I believe he would have had a permanent success, or what we call a success. It would have been a compromise, of course, but at the same time nothing could put those mandibular first molars back again. That is my way of looking at this case. I thought Dr. Howe this morning showed a great deal of evidence to sustain the argument that we must sometimes compromise, and all of the gentlemen in the symposium expressed principles which indicate that Nature does not always give us the material to work with toward an absolute ideal.

Dr. Richard H. Stucklen.—I should like to ask Dr. Rogers what he thinks of the rôle of the mandibular third molar shown in his last slide.

Dr. Rogers.—The mandibular third molar was extracted in that case. That picture I showed was early. The first were radiographs taken and the third molar was subsequently extracted, but apparently made no difference whatever to the tissue changes.

The response to the use of intermaxillary elastics made no difference whatever; the same condition prevailed.

Mr. Raymond L. Webster.—As Dr. Hellman seemed rather emphatic in condemning space maintainers, as a matter of information I should like to ask him if, where the premature loss of a second deciduous molar had taken place quite early, and perhaps with x-ray examination it appeared to be quite a while before the second premolar would erupt, he did not see a forward drift of that first permanent molar with no space maintainer—of course it does not always happen—but should he be so emphatic as to condemn at all times space maintainers.

Dr. Hellman.—It did not happen in the cases shown.

Dr. Jackson.—Is it unreasonable to believe, in light of the previous speaker's remarks, that the presence of a space maintainer might provide that stimulus necessary so that the growth processes occurring in the posterior part of the mandible might continue forward to the anterior part? That chain has been broken by the premature removal of the deciduous second molar. I agree that the ultimate fate of that space may be immaterial or unimportant relatively, but it is quite possible that the space maintainer would have a more important rôle to fulfill if we changed its name to a transmitter of growth space. I have no evidence that this does take place, but in view of the difficulties encountered, do you not think it might be worth while to try it in that rôle?

Dr. Hellman.—It is useless to talk about it. I have just shown you a case, and I have several more of those to show, where the space is closed up, it naturally opened up again, so what do you want a space maintainer there for? If it does not close up, as I showed in several cases, then there is no need of space maintainers. If you find that you can use a space maintainer for a certain particular case which under no other conditions will do what

you want it to do, by all means use it, but first make sure that you are right. Do not put any appliance in any child's mouth unless you are sure you are right in doing so.

Dr. Futterman.—I cannot help but take exception with our teacher, Dr. Hellman, when he speaks on the subject of space maintainers.

I have just gone through some writings on the subject, and I will merely try to quote what some other research men have done on this. For instance, Dr. Samuel J. Lewis of the Merrill Palmer School has done a great deal of research on this, and he has definitely shown that malocclusions do result because of premature loss of teeth. Dr. Willard Stevens' writing has also shown a number of malocclusions which have resulted from premature loss of teeth. Dr. Kantarwitz, of Bohn, Germany, has also shown in a very schematic way definite drifts and changes in the arches at least. Drs. Stanton and Goldstein, in the INTERNATIONAL JOURNAL OF ORTHODONTIA, also show graphically changes in the arches.

Therefore we know definitely, as we can see them, that a number of malocclusions do ensue where teeth are prematurely lost. Of course, we also know that malocclusion does not always ensue. That is absolutely no reason in my mind why we should not place space maintainers just because the children do not always have that condition. It is the same analogy as pertains to diphtheria. Just because all the children in a community will not get diphtheria is no reason why inoculations should not be given and why there should not be campaigns to immunize children to diphtheria.

If we can place space maintainers in the arch so there is no loss of tooth structure, and if those space maintainers can be placed so there is a normal functioning and development of the arch, our safe bet is always to place a space maintainer, and I am one hundred per cent for space maintainers even though we do not always get malocclusion.

Dr. M. A. Munblatt.—I was not going to say anything today, but, having heard the name of Lewis mentioned as an example of a contributor on the question of space maintainers, I feel I am more or less duty bound to make some remarks. I was with Dr. Lewis almost two years, and responsible for the gathering of a good deal of the material he has there.

The question of space maintainers is quite an important one today. We should stop talking about it and gather facts about it, because if we go on as we are at the present time we shall find ourselves creating a lot of damage by the insertion of appliances or by the encouragement of the insertion of appliances by general practitioners as such insertion is being encouraged today. There is not a meeting held today at which the orthodontist, for the sake of having something to say to the general practitioner, does not advocate the insertion of space maintainers.

When I was with Dr. Lewis, I watched those children. We had casts of almost 500 children collected at the Merrill Palmer School. I have been with Dr. Hellman now for the last four years, and Dr. Hellman keeps under observation children with malocclusion, sees children at different stages, and records are made of these children. Of all these cases, having recorded casts at different periods, and having examined and watched all these children both at the Merrill Palmer and in Dr. Hellman's practice, because the casts come through my hands, there is not one case where I feel the child would have been benefited by the insertion of a space maintainer.

GROWTH OF THE JAWS AND THE ETIOLOGY OF MALOCCLUSION

ALEXANDER SVED,* B.S., D.D.S., NEW YORK, N. Y.

(Continued from page 229, March)

CHAPTER VIII

THE ABNORMAL GROWTH OF THE JAWS AND THE DEVELOPMENT OF MALOCCLUSIONS

We have already considered the normal growth of the jaws, and the relationship of the teeth in normal occlusion. The common occurrence of jaw deformities and irregularities of the teeth brings us to a parallel study of these conditions so that corrective procedures may be more intelligently undertaken. Deviations from the normal may occur during growth as a result of some injurious influence, but whatever may be the nature of these injurious agents, their ultimate effect is on the processes of growth.

A deformity manifests itself in deviations from the normal relative dimensions of the affected part. If there is no deviation of relative dimensions from that of the normal, no deformity can exist. It follows, therefore, that when a deformity is produced under the influence of a nocive agent, the processes of growth are not interfered with to the same degree in every direction. If the nocive agent is of a general character, the intensity of its action must be the same on all growing tissues of the same kind. Thus, bone tissue must be similarly affected throughout the entire body, although the effect on muscles and nerves may be different. The injurious influence in itself cannot produce differences of action on the same kind of tissues; therefore we must look for an explanation of the varying degrees of interferences in the characteristics of growth of the affected parts.

We know from the interpretation of Hellman's measurements that the relative rates of growth in the different directions of a bony part are different, and, since the rate of growth is responsible for the rates of increase of the several dimensions, the production of a deformity must arise from the disturbances of the relative rates of growth. But the intensity of the nocive agent cannot vary at the same time in a part of an individual; therefore the disturbance of the relative rates of growth in that part is a manifestation of the alteration of the growth processes in the different directions. In other words, a bony part may grow faster in one direction than in another, and, according to Jansen, the dimension which increases most rapidly during growth is most likely to suffer under the influence of an injurious agent.

In the study of the abnormal growth of the jaws several factors must be taken into consideration. It becomes necessary to determine what constitutes an abnormality. The great variations in size and in relative measurements

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of normal jaws indicate that the relative rates of growth are subject to variation in different individuals. As a result of this, different types of individuals develop within normal limits, so that normality could not be defined by the measurements of form. This, as we have seen, is variable, but all the different types of normal individuals display a *characteristic positional relationship* of the jaws and the teeth, which is recognized as normal. Furthermore, this relationship of the jaws is interpreted in terms of the relationship of the maxillary and mandibular teeth, for at present we do not possess other means by which the jaw relationship can be adequately expressed. The positions of the teeth with respect to each other are more easily defined. The study of arch form, for which a formula can be derived, definitely determines the position of a tooth in relationship to every other tooth in the same and in the opposite dental arch. The relationship between the maxillary and the mandibular dental arches determines the positions of the teeth with respect to the teeth in the opposite jaws, and, if this relationship is satisfied, the development of the jaws is considered normal. Any deviation from these relationships constitutes an abnormality. Thus, so far as our present knowledge permits, an abnormal growth of the jaws manifests itself in a derangement of the relationships between the teeth in the same and in the opposing arches. From this it appears that even the slightest deviation from the accepted normal form of the dental arches or the alignment of the teeth is accompanied by a small but corresponding jaw abnormality, and for this reason the deviations from the normal arch forms and arch relationships will determine the degree of abnormality in the growths of the jaws.

The study of jaw deformities and their causative factors may be approached in different manners. It was pointed out, however, that due to great variability in the normal, measurements alone cannot throw light on individual cases unless other factors are considered. Brash approaches this subject by a comparative study of the normal and abnormal, from which the conclusion was drawn that variations and disturbances occur in the main directions of growth. At the same time he rejected the conception of Jansen, who advanced the theory that deformities may result from the feebleness of growth caused by an injurious agent acting on a growing body. The degree of the deformity is supposedly determined by the intensity of the injurious agent and by the law of the "vulnerability of the fast growing cell groups." From the etiologic point of view Jansen's conception may not be entirely satisfactory, but on a closer examination Brash's conclusions verify the vulnerability of fast growing cells. In fact, Brash's conclusion is another, but more limited statement of the law of vulnerability. The coincidence of this theory with observations derived from another source opens up another method of approach, which depends upon data obtained from an independent investigation. Here we refer to the studies conducted by Hellman, the purpose of which was to determine the changes in the human face during the development. From the reinterpretation of his studies we arrived at definite conclusions regarding the rates of growth in the different directions, and the relative rates of growth were calculated.

Now Jansen's conclusions have a direct bearing on the rates of growth, and since Brash's observations confirm Jansen's statements, there must be a definite relationship between the work of Jansen and the conclusions drawn from Hellman's measurements. True enough, these authorities do not see the connection between their respective endeavors; nevertheless it is possible to show that the different types of malocclusions can be produced by correlating these independent conclusions and results of observations.

In order further to investigate Jansen's conceptions, his theories will be applied to a hypothetical individual, having the average relative rates of growth as determined from Hellman's measurements. It must be pointed out, however, that in this investigation only one etiologic factor will be considered, namely, that of a *systemic disturbance*. We know that several other factors may be responsible for a condition of malocclusion, but it will be shown that all injurious agents operate on the same principle, and the following discussion will in part be applicable to all possible etiologic influences. The purpose of this investigation is to show how malocclusions may develop in a growing individual. The study of the causative factors is another matter, which will follow the theoretical consideration of the development of malocclusions, and the corresponding abnormal growth of the jaws.

Angle classified the malocclusions of the teeth into three classes.[1] This classification depends upon the relationship of the mandibular dental arch to the maxillary arch. Briefly stated,

Class I	Arches in normal mesiodistal relations.
Class II	Mandibular arch distal to normal in its relation to the maxillary arch. This class is further subdivided into Division 1—Protruding maxillary incisors. Division 2—Retruding maxillary incisors.
Class III	Mandibular arch mesial to normal in its relation to the maxillary arch.

Out of several thousand cases of malocclusion examined, the proportion per thousand belonging to each class was as follows:

Class I	692	69%
Class II (Div. 1-124)		
(Div. 2-142)	268	27%
Class III	42	4%
	1,000	100%

These figures show that in more than two-thirds of the malocclusions of the teeth the anteroposterior relationship of the jaws is normal. Almost the entire remaining one-third belongs to Class II, and only a very small percentage of Class III cases occur. This indicates that primarily malocclusions are due to underdevelopment, and that overdevelopment either is accidental or is brought about by some unknown influence. Attempts have been made to account for the occurrence of overdevelopment by an assumed overactivity

of some of the glands of internal secretions, but it is difficult to understand just why the mandible should be singled out under such conditions, and especially because in nearly all mesioclusion cases the overdevelopment of the mandible is accompanied by an underdevelopment of the maxilla. If the endocrines are responsible, then similar tendencies must become evident throughout the entire skeletal system, which so far has not been observed.

A more acceptable explanation of the development of malocclusions may be found in the characteristic response of bone to pressure. We know that normal bone responds to more vigorous function by a thickening of its walls. Within certain limits this is progressive, so that the more vigorous the function becomes, the thicker the bone will be. Beyond this limit, however, an increase of functional pressure or stress produces resorption of bone; thus we have a mechanism which automatically limits overdevelopment, and a point is reached beyond which no further growth can take place. Jansen advanced the theory that under the influence of injurious agents the reaction of bone to pressure stimuli is altered, and, while there is a similarity of response, there is a quantitative difference between the reactions of bone thus affected and those of the normal bone. According to this conception the nocive agent brings about a "feebleness of growth" in the various tissues of a growing individual, the degree of which is in direct proportion to the intensity of the nocivity and the rapidity of growth. It is further pointed out that the earlier in life such disturbances of growth occur, the greater the resulting deformities are likely to be; and a part well advanced in its development cannot be much affected even by very severe injurious influences. The reaction of bone to functional stresses is different in the different degrees of feebleness of growth. This difference in response is shown graphically by Jansen for normal bone, and for bone affected by slight and severe feebleness of growth (Fig. 25, p. 228, March issue). Any intermediate degrees of feebleness may be judged approximately by proper intermediate values between the extreme degrees represented by the curves.

These curves indicate that if the normal pressure on normal bone is slightly increased, the bone is increased up to a certain point. Beyond that point the increase in pressure is accompanied by a retardation of growth. Similar reactions occur in individuals affected by any degree of feebleness of growth, but, as curves II and III indicate, the affected skeleton responds more readily to pressure stimuli and in slight feebleness the rate of growth may even be greater than normal. The retardation of growth begins under less pressure than in the normal individual. Jansen refers to these phenomena as the "*enhanced sensibility* and *enhanced fatigability* of the skeletal cells."

Jansen's theories may bring us nearer a solution of the problems which arise in the study of the etiology of malocclusions. As was shown before, malocclusions are invariably accompanied by malformations of the jaws, and, if we extend the theories to the more delicate localized effects in a single bone, we may arrive at a more logical explanation of the phenomena which are responsible for the abnormal growth of the jaws.

It is not definitely proved and in many quarters it is not accepted that these conceptions are true. But further study will show that there is truth in this interpretation of growth, and the mode of formation of dental and jaw abnormalities depends largely upon the principles enunciated by Jansen.

The reinterpretation of Hellman's measurements of the human face enables us to express the relative rates of growth by numbers. If we examine Table VI (Chapter VI) obtained from this reinterpretation, we shall note that the rates of growth vary from zero to approximately eight times the rate at which the maxillary arch width in the first molar region increases as a result of the growth on one side. These differences in the rates of growth may be responsible for some deformities, and according to Jansen the dimensions which increase more rapidly are more likely to be affected. It is interesting to note that these rates are attained in the majority of instances at the age of six years and that they continue uniformly to the age of twelve or beyond. In four regions, however, the maximum rate of growth is attained earlier in life, and it continues at that rate throughout the developmental period. These four regions are the maxillary and mandibular canine regions, the anterior palate depth, and the basal depth. This is a very important part of the mechanism of growth. Lateral expansion in the anterior part of the mouth and the anteroposterior development of the face begin earlier in life than the development in the vertical direction.

An injurious influence may become operative at any period. A severe illness in the first year of life may produce a marked disturbance of the growth processes and every part of the body may be affected. From the data at our disposal it is possible to predict the direction of greatest disturbance. Jansen is of the opinion that feebleness of growth can occur only in the first years of life, and this opinion is supported by numerous examples.

The effect of a nocive influence on the jaw bones between the second and sixth years is easily determined with Jansen's assumptions from the table of the relative rates of growth. Accordingly, the four areas which attain their greatest rates of growth at this early period will be the first affected. At this time the "basal depth" increases at the greatest rate, which is the anteroposterior measurement of the mandible. In response to a mild interference with growth the first reaction will be an increase in the anteroposterior growth of the mandible, and this follows directly from the "pressure growth" curves. If the intensity of the nocive influence does not become greater, this increased rate of growth may persist for some time and produce an anteroclusion, which corresponds to Class III of Angle. The growth in other directions may be similarly affected, but in proportion to the respective rates of growth and because of the slower rates the effects may not be discernible. Thus it may be said that anteroclusion (Class III) is due to a moderate feebleness of growth, for slight feebleness does not affect the skeleton. If the action of the injurious agent is more intense, the basal depth of the mandible may be more severely influenced, and instead of the primary increase in growth, the rate may be decreased in accordance with the descending arm of the curve or the

increased fatigability of the bone cells. At this time, however, the anterior palate depth may be injured to such an extent that the primary increase in growth may occur. Thus, instead of an increase in the anteroposterior length of the mandible a retardation of growth takes place, together with an increased forward growth of the maxillary teeth. This will result in a condition of posteroclusion, which resembles Class II, division 1 of Angle (a distoclusion with protruding maxillary anterior teeth).

A still further increase in the intensity of nocivity will bring about a retardation of growth in the anterior palate depth, so that a combination of posteroclusion with retruding maxillary anterior teeth will be brought about, corresponding to Class II, division 2 of Angle. It is not to be understood, however, that these conditions of malocclusion appear immediately after the appearance of the nocive influence. Growth is an unfolding process, and the immediate effect on form is not observable. The injury can manifest itself only in later years in increased or decreased growth, in the directions mostly affected by the injurious agent. And again, it must be borne in mind that growth is affected in every direction, but the response is not the same. It is very likely that the upper and lower face heights are also affected even before these regions have reached their maximum rates of growth, and this may account for the great frequency of deep overbite conditions in connection with posteroclusion cases.

Here attention must be called to the fact that the table of the relative rates of growth was obtained from Hellman's measurements. The material for these measurements was classified according to physiologic ages, and the basis of this classification was the time of appearance and the presence of certain teeth. From our point of view this is not a very accurate classification, because the different groups contain younger and, in most instances, older specimens than the equivalent physical or chronologic ages. This must necessarily affect the numbers expressing the relative rates of growth, and for this reason they should be looked upon only as reasonable approximations. On the other hand, even with considerable deviations from the true values, the final reasoning can hardly be altered, and the conclusions will remain the same.

In the table the appearance of the permanent first molar corresponds to six years of age. This is a critical period because up to this point the interlocking of the cusps of the deciduous teeth is not sufficient to retard the growth of the mandible. It has been noted that immediately after eruption the distal surfaces of the deciduous second molars are almost in the same vertical plane. As the time of eruption of the permanent first molar is approached, this relationship is gradually changed to a more forward relationship, and a better interlocking of the deciduous teeth is established. This forward shift may take place as a result of alveolar growth, or a growth from behind forward; but, whatever the case may be, the forward shift is a normal characteristic phenomenon. It can be easily seen that an interference with growth may produce a posteroclusion under these conditions. After the permanent first molars find their positions and the opposing teeth are properly

interlocked, the production of a posteroclusion can take place only under unusually severe injurious influences. For this reason the causative factors of a posteroclusion should be found most frequently under the age of six or seven years, and the most pronounced cases should date back to a much earlier period.

The observations of Angle take on a deeper meaning in this connection. He observed "that the three classes of malocclusion are determined by the locking on eruption of the first permanent molars. Normal locking characterizes Class I; distal to normal to the extent of more than one-half the width of one cusp on each side characterizes Class II; and a mesial locking to the extent of more than one-half the width of one cusp characterizes Class III." These statements and observations imply that after the locking of permanent first molars, self-correction of abnormal jaw relationship will not take place except under abnormal conditions. This was repeatedly confirmed and was accepted as a fact without reservations.

Thus it further appears that injurious influences operating early in life are more likely to produce abnormal jaw relationships than similar influences at a later period; and, if the disturbances in growth do not become evident before the locking of the permanent first molars, the jaw relationship will remain normal under the purely mechanical action of the occlusal inclined planes. This is in conformity with the frequency of occurrence of the various classes of malocclusion. Assuming that all malocclusions are the result of injurious influences, we must take into consideration that these may become operative at an earlier or later period in different individuals. Under normal conditions an injurious influence occurring after six years of age cannot have an effect on the mesiodistal relationship, and all such cases will develop into Class I. A nocive influence before the age of six years may or may not produce a Class II condition, depending upon its intensity and its period of action. Class III malocclusions can be produced only by a slight injurious effect which is well timed, otherwise the case may remain in Class I, or with the increase in the severity of nocivity it may be pushed into Class II. For this reason Class I contains the largest percentage of malocclusions, and all the remaining malocclusions belong to Class II, with the exception of a few well-timed slightly injured cases, which make up the small Class III.

The upper and lower face heights reach their maximum rates of growth at the sixth year. While the growth in the vertical direction may be considerably affected at an earlier period, a nocive influence will have its greatest effect between six and twelve years, and the earlier it occurs, the more profound will be the effect. The anteroposterior growth may also be influenced, but on account of the locking of the permanent molars the relationship of the jaws will not be affected. As a result of retarded growth a deep overbite may develop even if it did not exist when the first molars erupted, and slight disturbances may bring about an open-bite condition.

During growth the maximum alveolar width has the slowest rate of increase. The minimum alveolar width, on the other hand, increases somewhat more rapidly, and it attains its maximum rate much earlier in life. For this

reason it is more likely to be affected than the width in the molar region, and this is confirmed by the frequent crowding of the anterior teeth.

Thus the theories of Jansen applied to the table of the relative rates of growth obtained from Hellman's measurements apparently explain the possible development of malocclusions. Further investigation may prove that this is a logical approach toward the solution of the problem of malocclusion.

REFERENCE

1. Angle, E. H.: Malocclusion of the Teeth, ed. 7.

(To be continued.)

THE MIDDLEBURY, VERMONT, CASE

ON MAY 15, 1935, three skeletons were found near Middlebury, Vermont, presumably a mother, son and daughter, or mother and two sons. Each one of them was shot through the head with a bullet of a .38 caliber, autoloading type revolver. The approximate ages were: mother, thirty-five to forty years; boy, about twelve or fourteen years; boy or girl, ten or eleven years.

The length of time that these skeletons had lain there is placed at two to five years by some. A root which grew over the shinbone of one of the skeletons gives the latest clue as to the time and places it between eleven and thirteen years ago.

The boy whose age is estimated at about thirteen years had fixed in place on both the maxillary and the mandibular arches orthodontic appliances known as the Angle ribbon arch, manufactured by the S. S. White Dental Manufactur-

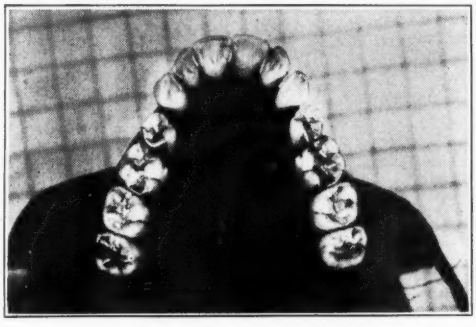

Fig. 1.—Maxillary teeth of mother.

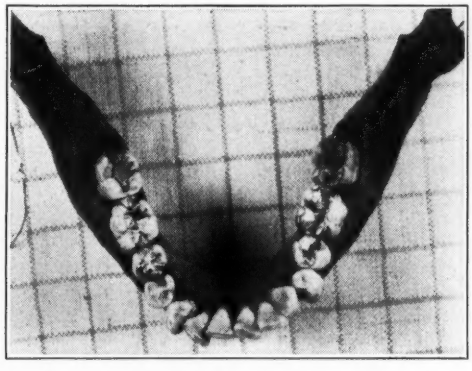

Fig. 2.—Mandibular teeth of mother.

ing Company. It appears that the boy was under orthodontic treatment at the time of his death. His hair was extremely light and he was tall for his age, as were the other two skeletons as well. The assumed mother had dark hair and many gold fillings and inlays in her teeth. All three individuals had prominent maxillary teeth and narrow constricted arch, presumably of the Class II, Division 1 type, or the Class I, Type 2 type of malocclusion.

The skulls and teeth were taken to Boston and to New York City where a conference was held with a number of orthodontists. The State Investigator* of Vermont has asked the cooperation of the INTERNATIONAL JOURNAL OF ORTHODONTIA AND ORAL SURGERY in extending any information or clues possible which might lead to the identification of these bodies. Inasmuch as the type of appliances used was the Angle ribbon arch, which is not so widely used, it seems that it should not be difficult to obtain information in regard to the identity of these individuals by contacts through the orthodontic fraternity.

* Mr. Almo B. Franzoni, Montpelier, Vermont.

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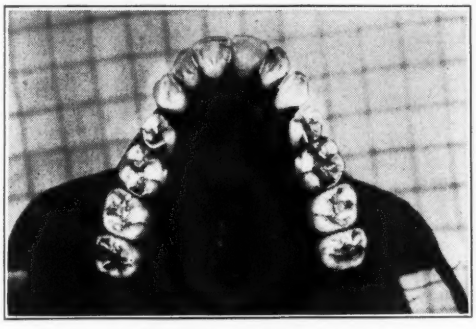

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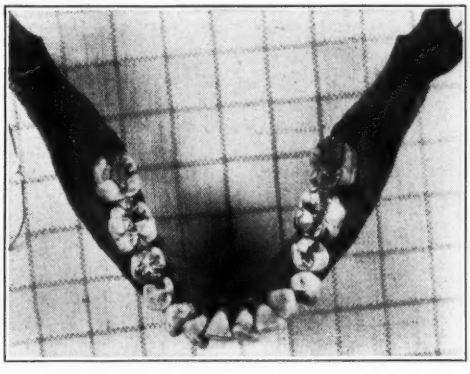

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The JOURNAL is publishing herewith the report of several orthodontists, made under the supervision of Dr. Alfred P. Rogers of Boston, and excerpts of the report made by Dr. E. A. Hooton and his assistant of Harvard Medical School in regard to the skeletons.

The older child, the one with the orthodontic appliances in place, was between twelve and fourteen years of age—probably around thirteen. The condition of teeth is found to be excellent. They are of exceptionally good quality and show no evidence of caries. The maxillary arch form corresponds very nearly to the Hawley Chart 36. The six anterior teeth fall exactly on the line while the bicuspids and molars are about 2 mm. to the lingual. Therefore, the maxillary arch might be considered about normal for this type of child, who was

Fig. 3.—Skull of mother, of older child, and of younger child.

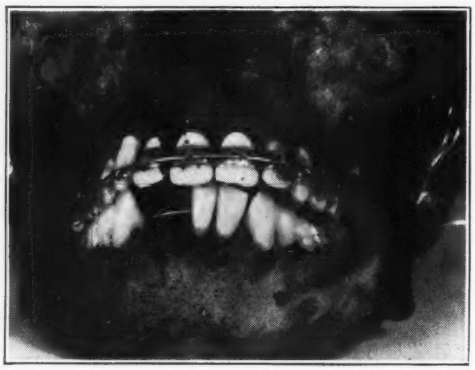

Fig. 4.—Older child, showing occlusion and orthodontic appliances in place.

probably of slender stature. The second molars were on the point of erupting, but the left second molar shows evidence of some delay. The third molars were in the process of development. The maxillary central incisors measure 36/100 inch in diameter. The child was being treated for bilateral distoclusion with a slight narrowing of the mandibular arch. The mandibular incisors were somewhat protruded. The mandibular right second molar had erupted to the point where the mesial cusps had just penetrated the overlying tissue. The mandibular left second molar had erupted somewhat farther than the right. The mandibular bicuspids and molars were not in need of rotation, as is very frequently found in children of that age. They have well-developed cusps with deep sulci.

The incisal edge of the maxillary left central incisor has a slight chip broken off involving the lingual plate. The orthodontist who adjusted the appliances to this child was a man who used careful technic.

The appliance (Fig. 4) which is adjusted to the maxillary arch is known as the Angle ribbon arch. It is attached to molar bands cemented on the first molars, to which are soldered curved linear tubes. The nuts anterior to these tubes are sheath variety. The four bands which are cemented to the four maxillary incisors are fitted around the middle third of the incisors. The orthodontist who adjusted these bands had placed a solder reinforcement on the lingual surface on the right lateral and central incisor bands. The left central and lateral incisor bands were not quite so well adjusted on the lingual aspect. The molar bands were made of the gold band material, probably of platinum alloy, with soldered seams on the lingual surfaces. They have the appearance of having been made by the indirect method. There are a few marks which would indicate that the bands were brought to place by the use of small band drivers. The operator exhibits his careful technic from the fact that the intermaxillary elastic hooks which are placed opposite the mesial third of the maxillary canine have been carefully balled on the ends. Also this operator has the habit when pinning his appliance in place of turning the ends of the pins toward the median line—

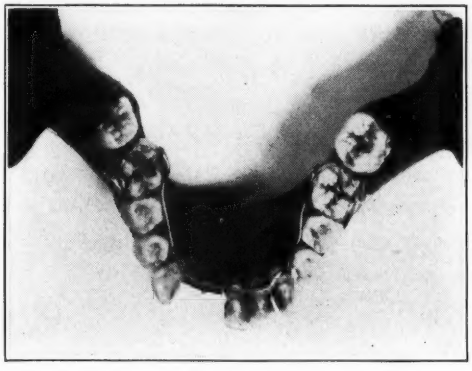

Fig. 5.—Showing mandibular arch with appliance in place.

that is, the pins on the right central and lateral incisors turn to the left while the pins on the left lateral and central incisors turn to the right. There are no lingual extensions soldered either anterior or posterior to the maxillary molar bands.

On the mandibular arch is a lingual wire made of 19 gauge gold wire. (Fig. 5.) The lingual wire is attached to gold bands cemented to the mandibular first molars. On the lingual surfaces of the mandibular first molars are soldered half round tubes between the mesial lingual cusp and the distal cusp. The lingual wire is held in place by a half shaft soldered to the lingual wire which fits exactly the half round tubes. The lingual wire has no loops anterior to the first molars. This fact narrows down the investigation by excluding all those who use the lingual wire loop in their technic. The spring locks which are designed to hold the lingual wire in place are soldered to the distal end of the lingual wire about 1.5 mm. posterior to the tube and are of a smaller gauge (0.028). There are intermaxillary hooks soldered to the buccal surfaces and the mandibular molar bands. The one on the right is soldered nearer to the occlusal surface than the one on the left. These hooks are also balled on the

distal end. The bands had probably been in place for some time, as they show wear. They were cemented in place with brown oxyphosphate cement. There are several manufacturers who make this cement. Ames cement is quite generally used.

This child probably experienced difficulty in wearing the intermaxillary elastics because of the fact that when the teeth are in occlusion the maxillary molars, particularly the right, impinged so closely upon the right mandibular intermaxillary hook that it must have broken the elastic frequently.

The salient points which should help in identification are:

First, the method used by this operator in bending the maxillary arch wire pins toward the median line. This man was meticulous in his technic and probably always followed this method when using this type of appliance.

The slight chip which is broken from the maxillary left central incisor would probably show in any plaster model that had been taken prior to the orthodontic work.

This operator was in the habit of using a small amount of solder in making the attachment of the curved linear tubes to the buccal surfaces of the maxillary first molars. He used brown cement in setting the bands. He used gold lingual wire without loops anterior to the first molars. At one time during the treatment it appears that he may have used small spurs just anterior to the mandibular first premolars.

His lingual wire lock is of the square type, not rounded on the posterior end. The fact that he used a smaller gauge wire for the spring in the lock would indicate that his treatment was not to use this lock as a spring lock but to force it into place by pressure with an instrument. This observation is only a possibility.

Orthodontists who may be eliminated from studying their lists are those who make use of removable appliances in the treatment of this type of case and those who employ loops anterior to the first molars in the lingual arches.

THE RÔLE OF THE DENTIST IN PROMOTING AND CONSERVING CHILD HEALTH

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IT IS common knowledge that the pioneers of the movement which led to the birth of dentistry did their best to have our profession adopted by its logical parent, Medicine! You all know the movement was unsuccessful, and we were cut adrift to seek our own way in the world. The needs of the public in our pioneer days were relief from pain and replacing of missing teeth. Naturally, our initial efforts were to supply these demands, and we focused our attentions on the mechanics of these procedures to enhance our skill in filling teeth and making artificial dentures. At that time no one had ever heard of focal infection or oral sepsis; there was no radiography to help in diagnosis or treatment. In operative procedures, if an orthodox preparation endangered the vitality of a pulp, then the pulp was destroyed, usually with arsenic, and the root canal filled more or less, giving plenty of room for retention. In case of an alveolar abscess, if it pointed on the gum, it was opened and very frequently left (because it had been drained). On the other hand, if an apical inflammation did not point, the tooth would be opened and left open; in some cases a small tube was placed in the root canal. Drainage was all that was considered necessary; if a tooth gave no clinical symptoms, such as swelling or tenderness, it was left alone on the principle: "Don't borrow trouble."

Twenty years ago this was considered good practice.

Do we consider it good practice today? I wonder . . . I wonder whether it is not considered good practice in some offices regarding children.

Now the question that we, as conscientious dentists, must ask ourselves is whether in the recent advance of knowledge in bacteriology, pathology, biology, and endocrinology, we are justified in treating cases in the old-fashioned way; ignoring truths to adhere to customs of the horse-and-buggy days. Let us not be so accused by our patients.

If dentistry is to retain its prestige, it must, like medicine, include all the preventive measures necessary in our field to render a health service to the community. To keep abreast of medicine, dentistry must also take care of that portion of the population known as children—not in a superficial, haphazard way as in the past, but in a way that will render a genuine health conserving and promoting service to the patient.

To help conserve and improve the health of our citizens, the official and unofficial health agencies have included a mouth health program in their attempt at education of the individual in personal hygiene and health habits. They study services locally by boards of education or health departments and

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develop standards and policies for providing preventive dental health service for children. They assist in the plan of educating the expectant mother on prenatal care as to diet, and care of her own mouth and teeth; also, the parents of preschool children, stressing diet, constant supervision by the dentist, and cleanliness. They aid in planning and assisting boards of education to initiate and continue preventive activities by educational programs in elementary schools. They assist dental groups, school clinics, and local health departments to carry on periodic supervision for part-pay patients and indigents.

With all these activities being carried on for the public good, there remains an insufficient demand by a large part of the public for dentistry, due in part to a lack of understanding of the value of systematic dental health service and in part to the failure of the profession in carrying out the teachings of our health departments. Health workers are trying to educate the public in regard to the evil effects of mouth infection; but when children with abscessed teeth are taken to the dentist, many dentists say: "Leave the teeth alone, they won't do any harm. They are needed to hold space," or, "they will drop out after awhile." Many deformities are caused by parents heeding such advice from their dentists. Many dentists do not seem to know that the roots of deciduous teeth usually do not absorb when the teeth are pulpless. But the question we are interested in here is: If infection is a menace to health, it should be eliminated! If it is not, then health departments have no right to employ dental health workers, and all this talk about the need for dental health education and preventive dentistry is nonsense.

The public has little knowledge of the vast difference between restorative and preventive dentistry, but it is learning fast. The skill and art of modern dentistry have attained a high state of perfection, but unless we apply our professional knowledge to preventive health measures and help with the education of the layman in regard to mouth health, we have no right to call dentistry a profession. Without this application, it, in truth, is but a craft.

This places on our shoulders the added responsibility of being a teacher. Many dentists are not teachers. Probably most are not. However, Horne in outlining the essential qualifications of a teacher says: "The teacher must know his subject and he must also know his pupils." These two essential qualifications we should be able to meet admirably. The methods of a pleasing presentation and correlation can be acquired by proper application.

Kent says: "It is hard to make educators, even though our field of instructive activity is confined to the simple limits of personal contact with patients. Unfortunately, the quack understands the art of office education so thoroughly and uses it to such a degree that he places himself in a falsely brilliant light, while the ethical man too often fails to place himself in his proper light. He should establish himself in his patient's mind as a guardian of health in contradistinction to a tooth filler."

And Dixon says: "We must recognize that though we acquire our knowledge through individual and group practice, our findings, ethically speaking, belong to humanity at large."

Today, as never before in the history of dentistry, we have an opportunity to do a wonderful service in the development and application of preventive

dentistry by educating parents to the health value of the proper dental care for their children. We hear a great deal about the prevention of social and physical ills through preventive medicine and sanitation. There is no doubt these subjects are applicable to all ages of life; but preventive dentistry—its application and practice—produces the greatest results in the first eighteen years of life.

Like all sound undertakings, the theory of preventive dentistry is mutually profitable—the patient preserves his teeth and the dentist increases his income. But the gulf that exists between the theory of the profession and the practical application of prevention to the public is wide. The practice of dentistry has not kept pace with the philosophy of dentistry.

This is one of the most difficult problems that confronts dentistry. How can many of the profession be led to correlate the truths that have been taught, and are being taught to the public, with honest, conscientious preventive health service in their everyday practice, with particular reference to the children? This is a problem that we, as members of the profession, must solve and not continue to pass resolutions and give lip service as we have in the past. I wonder what would happen if the public became educated and wanted the type of health service we contend they need as much as they want automobiles, radios, and movies. When people desire things that much, they usually try to get them in some way. Suppose the public should take us seriously and demand for themselves and their families this type of service we are telling them they need? How are they going to get it with the present attitude of some of the profession? Think what might happen to the dental profession if this should occur. Some dentists believe that the education of the public will force the solution of the matter. It may, but not in the way the profession wishes. Dental health workers know that education of the public to desire dental health service is progressing more rapidly than the profession can supply the service, at the present rate of adoption by the general practitioner of dentistry.

Maurice Williams sums up the situation in a few terse sentences when he says: "Restorative dentistry is a luxury. It is dentistry for the few. For a vast majority of the American people, it is prohibitive. But perhaps the strongest indictment which can be brought against restorative dentistry is its irreparable neglect of the nation's children. A cardinal principle of dentistry is this: That of the several types of service which a dental office has to offer, the health value of the service is inversely proportional to its cost."

Your official, unofficial health services and professional leaders are adhering to this theory of preventive health service to the American families. It is a theory behind which the entire profession must unite and give active support, regardless of what specialty we may pursue, or dentistry will lose face and, I am almost tempted to add, faith.

If you persist in not wanting to do children's work, it is your duty to refer these patients to some one who will perform the job and refrain from saying "Just kid's work" or "it's only a baby tooth"—words which convey a false impression of the importance.

The possibilities of children's dentistry in a general practice are unlimited if you consider it a pleasure rather than a burden. An entire paper could be written on the subject of child control in a dental office. However, the salient points in working for children are the control of the fear stimulus, and the dentist's control of the child during the period of response to the fear stimulus.

Kenneth A. Easlick in the January, 1935, issue of INTERNATIONAL JOURNAL OF ORTHODONTIA AND DENTISTRY FOR CHILDREN, pages 86, 87, has this to say under "The Dentist's Management of Young Children": "Children's dentists are attempting control of the fear stimulus through explanation, use of sharp burs, performing a painless first appointment operation, manipulation of appointment, permitting pre-appointment visits, and substituting more disagreeable stimuli for the incorrigible. They are controlling the child's responses to fear stimuli in two ways:

"(1) By enlisting cooperation through built-up fortitude, and

"(2) By recognizing the child's personality.

"Fortitude is built up by rationalizing fears, leaving the subject of pain for the dentist, being honest about pain, securing relaxation, and developing pleasant thinking about the dental office. Addressing the child by his first name, appealing to his desire to appear grown up, utilizing genuine flattery, using the operating stool, excluding the parent, developing an office atmosphere of mutual respect and camaraderie, and showing respect for the child's fears, are all aids in utilizing recognition of a child's personality. On this basis, one might reasonably conclude that the children's dentists who are contributing to the dental literature are consciously or unconsciously invoking child psychology while practicing 'horse sense' on their child patients."

Using the above as a criterion, there is little difference between the handling of children and adults. I venture to say you all use the same type of office procedure in handling your adult patients, unconsciously perhaps, but if you do not, try it for a change, and see the astonished, satisfied response of your patients.

The only difference in office procedure as regards the dentist and child patient relationship is that the dentist must leave his grouch at home in the morning and develop a gentle but firm command of himself and his instruments. Children are miniature men and women. They are little different from their mothers or fathers. If you handle their parents with a little patience and with constant prodding on your part or that of your assistant, you can handle the children. You have a very decided advantage over the pedodontist in that your name is more or less familiar to the child through hearing his parents talking of you. When the child arrives, call him by his first name, call a cheery good-bye when he leaves, compliment him on small things such as promptness, neatness, cleanliness of clothes, etc. Find out what each child is interested in, learn to speak their language, ask them to help by holding an instrument but keep control at all times with kind, but firm, commands. Appointments should not be longer than thirty minutes for the school age child and, if possible, less for the younger child. Periods of holding the mouth open should be short, giving frequent rests. Preferably, appointments

should be in the mornings when you and the child are fresh. For school age children, this will work a hardship which will make it necessary to set aside from about 3:00 to 5:00 P.M. and Saturday mornings, unless arrangements can be made with the school authorities to excuse these children from being credited absent. In that case, the children often appreciate the privilege of missing a few hours of classes to have their mouth conditions corrected. If you take the trouble to win the child patient's confidence by being natural, sincere, and honest with him, you will usually have a good and cooperative patient—one who will herald your praise to his entire world.

The physical appointments of the office in handling children may be as large and pretentious as one may wish to make. I believe, however, that until we have made up our mind definitely on the economic value of children's practice, and until our practice is such that we need to enlarge our operating space, I would not advise the installation of junior operating room equipment. I do believe waiting room furniture and some interesting type of diversion should be provided to make their visits as interesting as possible (particularly for children under school age).

When the child is seated and the chair has been adjusted to make him as comfortable as possible, notice whether his feet can reach the footboard. If not, some provision should be made to supply a foot rest. Otherwise, we run the liability of making the child restless by cutting off the circulation of the feet and lower limbs. If the child presents for emergency treatment, relief should be given as promptly and easily as possible. Otherwise, a thorough examination should be made and charted, using a small mouth mirror and explorer. If it is necessary to have radiographs made to aid in properly diagnosing the case at hand, advise the parent and insist on having it done. If the parent objects after you have explained the reason, note this on the record form. But, in most cases, if you have given sufficient reason for radiographs, you will not meet objections from the parents for this added expense. Examine each tooth separately and note any defect. If a tooth that should be present is missing in the deciduous or permanent denture, advise the parents of the fact, as well as the need for a space maintainer. Examine the soft tissues carefully and note any signs of gingival disturbances. Examine the occlusion with the teeth in contact. The examination of the child patient should be as thorough and painstaking as that of the adult. Habits which interfere with normal growth to any degree should be noted and advice given for correction. After making the acquaintance of the child, completing and charting the examination, it is often wise to use any remaining time in advising the parents of the needs of the case and give a new appointment. At the second or third visit a prophylaxis may be given, radiographs may be made; or you may wish to make simple compound impressions from which you can run casts of the case for future study and reference. By making measurements every six months or year of the palatal growth, you will be able to prove or disprove that Nature is keeping her schedule.

Many dentists believe that all of this is unnecessary and an expensive luxury—but is it? I doubt whether many future radiographs made for this patient will reveal more information in helping to prevent or eliminate

trouble. The lack of proper attention to the removal and retention of the deciduous teeth probably is the cause of as much malocclusion as any one thing that may be mentioned. In order to determine positively when a deciduous tooth is to be lost, use the x-ray picture. Age of patient and rigidity of the tooth are not positive proof. Using one or two pictures and comparing them to the original may more often than not be a deciding factor in aiding in the proper eruption and avoidance of a positive malocclusion. The deciduous teeth should be lost or removed in the same order as that of their eruption; unless, of course, disease or accident has made it necessary for early removal. Beginning with the central incisors, the teeth should be lost in pairs, those in the mandibular arch a few weeks before the opposing teeth in the maxillary arch are lost or removed. The loss continues from the central incisors, skipping the canines which are lost after or approximately at the same time as the second deciduous molars. The continuous observation of the deciduous teeth is a helpful aid in planning for the permanent denture, because individuals vary greatly. The removal of an approximating tooth should not be made to make space unless the extracted tooth's normal successor is to take its place. A very frequent mistake is made in the removal of the deciduous canine or allowing it to be prematurely lost by pressure from the erupting first premolar and lateral, particularly in the mandibular denture to allow space for the erupting lateral. Timely removal of the first deciduous molar, the need of which may be determined by an x-ray examination of the area, will in most cases prevent this. This condition is most prevalent in children of eight to nine years, and removal of the first deciduous molar will allow the deciduous canine to drift laterally, making space for the erupting lateral incisor, while the erupting first premolar is smaller than the first deciduous molar and will force its way through. The deciduous canine is saved to hold space for the permanent canine at the angle of the mouth where space is needed to keep the eruptive forces of the denture in operation to insure the needed growth.

The use of casts in checking for needed growth may also prove of value, particularly if the measurements are recorded on the casts for future reference. It is important that we have arch width; failure to have it should cause us to look elsewhere for trouble. The child may be underdeveloped physically, may be an abnormal breather, or an absence of spacing of the deciduous incisors should cause us to suspect congenitally missing lateral incisors. Despite all the arguments of the spacing of the incisors, those who are healthy growing and normal breathing children and really use their teeth to masticate their food in a vast majority of cases show this arch spacing.

The six-year molar is the forgotten tooth of childhood. Many parents do not know that this is a permanent tooth, nor do they realize the important part it plays in the developing denture. Since you are selected to take care of all the needs of the adult denture, it is but natural that you are expected to inform the parents that their children's permanent teeth will erupt at about six years of age; that they are important permanent teeth, and the early loss very often causes difficulties later in life.

The use of space maintainers as a preventive and interceptive factor is not new to the dental profession. In spite of the acceptance of their needs, we find numerous cases in which this safeguard has not been used to prevent malocclusion. Can we compare the service of preventing a child from having malocclusion with that of treating the case? When, at most, a few hours of work will very likely prevent the expenditure of months and perhaps years of orthodontic interference or permanent disfigurement for life? Has a faulty sense of delicacy, a poor interpretation of ethics, caused us to fail to inform our patients of the need of inserting functional space maintainers? If we as a profession make every effort to perform this portion of our duty, that is, educate the parent to the need of the maintaining appliance, then when they wake up to the fact they were foolhardy in not heeding our advice, the blame rests with them. Unfortunately, this is not the case at the present time. Let us bear this in mind, and when through accident or disease there is premature loss of deciduous teeth, the use of functional space maintainers is indicated.

The operative procedures that are put forth for children are many and varied, but the one that seems most simple and meets the real needs of children's dentistry is that proposed by Dr. R. C. Willett. It is not our intention, however, to describe Willett's technic. Those who are interested in this phase of the operative procedures for children should write the A.D.A. office in Chicago for a reprint of an article describing this technic, by Dr. Willett. In the December, 1934, issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA AND DENTISTRY FOR CHILDREN, was published an article *Technic for Cast Inlays, Overlays, and Space Maintainers* by Drs. R. E. Martin and H. W. Reinsmith. This article gives Willett's technic as well as the formula for preparing a metal that can be used, the cost not exceeding that of amalgam.

May I suggest a plan or experiment to induce you really to institute a preventive mouth health program for the children of your adult patients and prove to yourself the truth or fallacy of preventive dentistry? In this tentative program, set aside one morning a week for children, say Saturday from 9:00 to 12:00. Have your secretary write or call your patients on the call list and outline a procedure of yearly supervision for children. The yearly fee, for sake of convenience, we shall say is to be $10.00, paid in advance. For this fee, you are to supervise the dental health of the child patient for one year. You will see the patient at intervals of three months; at which time you will do a complete prophylaxis, mouth examination, measurement of arch growth, any additional radiographs that are necessary to aid you in diagnosing the case and intercepting or preventing trouble. Any operative procedures due to caries or accident are to be charged at the regular rate. The ideal time to institute this plan is, of course, when children are of preschool age. For convenience of computation, you may care for only 50 child patients in the first eighteen months, allowing six months to get your program under way. Do you not think you can really sell eight fathers and mothers a month on the real worth of a preventive mouth health program for six months? Allowing two hours per child per year, that is thirty minutes an appointment, 50 children at two hours each per year is 100 hours less time to worry where

business is gone to, and $500 more money to pay on the old mortgage, pay on the new automobile you have been wanting all spring, or to apply on the back rent.

The rôle of the profession in promoting and conserving child health is to continue to help state and local health agencies plan and provide the benefits of preventive mouth health service during the development and eruption of the deciduous and permanent dentition. By public health education, the mass of our population is slowly but surely being educated to appreciate dentistry as a health service. We should further the cause by office education of individual patients and practicing real preventive dentistry. We must realize that the public expects more and better service to more people. The history of our profession has given the public a right to expect this, and our professional leaders are accepting it as our responsibility. I believe in the very near future that dentists in general practice will do the greater part of the mouth health service of their community and be held morally and legally responsible for these conditions.

With economic recovery gaining, the status of dentistry is more favorable than it has ever been. Our profession is qualified to render a preventive health service, and we must deliver or lose face. The child of our creation, dental public health, is spurring us on; while the medical profession is turning to us for greater assistance and cooperation than at any time in the past.

Our future is very promising and the importance of dentistry as a health service is gaining by leaps and bounds. If we wish our profession to continue its ascendency, however, we must hew to the tenets and philosophy of our profession.

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DISCUSSION

Dr. Geneve G. Riefling.—Dr. Neber not only has chosen a timely subject but has presented it in a logical, scientific manner. Naturally, in presenting so many phases of this large field, many important factors mentioned could not be fully considered.

In one paragraph Dr. Neber presupposes a condition that actually exists. He states, "Suppose the public should take us seriously and demand for themselves and their families a type of service we are telling them they need. How are they going to get it with the present attitude of some of our profession?" You may thing this condition in the profession is exaggerated, but we have many facts that prove that a large percentage of the general practitioners do not observe these principles that are being advocated. If the majority of dentists incorporated in their dental practice the facts that Dr. Neber brings to our attention, surely the National Dental Survey as part of the White House Conference would not have shown that 95 per cent of the children in the United States are in need of dental treatment. Again the fact that children are not receiving the type of dental service that is being taught in our public educational programs is proved by the fact that children are brought to our offices by parents for treatment, the parent saying, "Dr. So and So does not believe in filling baby teeth." Another evidence of this neglect is frequently found in the dental clinics. Hardly a week passes without having some conscientious parent come in for advice on

deciduous teeth. These are persons who have heard radio talks or read some educational article on the care of children's teeth who come for advice when they have been told by their dentist, "It is only a baby tooth that will be lost so does not need to be filled." Many actual cases of even more detrimental advice could be cited, but time here does not allow full discussion.

Dr. Neber quotes Dr. Williams as stating, "Restorative work is a luxury, and dentistry for a few." This has been proved conclusively in these days of economic strain. The response to this statement is that this condition could be greatly relieved by scientific handling of child dental problems. Consider the costly, complicated conditions which our adult patients present that could have been avoided by scientific dental service in childhood. How many of the periodontal cases so frequently found in adults can be attributed to poor tooth alignment, traumatic occlusion, and soft, spongy hypertrophied gums and tissues from lack of toothbrush stimulation—all of which should have been corrected in childhood. The dentist following restorative work finds his cases complicated by tilted, rotated, and elongated teeth resulting from the lack of the insertion of space maintainers in childhood. How frequently our adult patients present a locked or closed bite, a condition we frequently see existing even in the deciduous teeth. And again the prosthodentist often finds his cases complicated by conditions that should have been corrected in childhood, such as abnormalities caused by faulty tongue and lip habits as well as the common thumb-sucking habit.

Many good articles have been published on types of restorations for children's dentistry, but an existing fundamental factor precedes this and is the stumblingblock for most men, that is how to get the child into the chair and how to manage the child so these restorations can be made. This brings us to the psychology of handling children. Many practitioners are overawed by this high-sounding term which really means the applying of common sense and a few scientific findings to handling the child patient. These problem patients range from about three to ten years of age. Any dentist with very little trouble could become more skillful in handling them by glancing through some authoritative book on child psychology. He will find there are about a dozen avenues of appeal which may be used as approaches when handling the normal child. A knowledge of these will provide the avenues of appeal that are characteristic at certain age levels.

As to the financial consideration of children's dentistry which Dr. Neber has referred to, this again is a many-sided problem. Personally, I think his suggested solution is very utopian. Fundamentally, in any phase, this problem is an economic one whose greatest returns lie in the future. No dentist who is a business man will expect maximum returns today. Children's dentistry is to our future practice what our insurance and annuity investments are to our financial security in later life. All investments with such a future guarantee necessarily net us small returns today. Our hopes are for the future. Will not the wise practitioner forego immediate attractive profits from children's work and consider what it can net him in his practice? Successful handling of the child patient will sooner or later bring the adult members of his family to us either through appreciation or obligation. Moreover, it must be admitted that a large percentage of the child patients of today can be converted into our adult patients of tomorrow. No economist could challenge the wisdom of this sound business policy.

Dr. Ruth Martin.—It should not be difficult to discuss a paper in which one agrees with practically everything the essayist says. Dr. Neber gives the members of our profession a very important part to play in the child health program. In fact, it looks as if we are each to be a leading actor in the play "Child Health," and we are called upon to learn our individual parts if the show is to go on.

In the light of the facts regarding oral conditions and the responsibility which dentistry should assume for the health of the people, there will be an increasing emphasis on the extensive and adequate use of all preventive measures that are known to be useful. There is abundant evidence to support the belief that the public will respond to these measures.

We all know that the appreciation of the importance of dental service for children has increased rapidly in recent years. More adequate attention is being given in the program of instruction in the dental schools. Eight years ago a very small percentage of the dental schools had segregated teaching units; today practically all of the 39 or 40 dental schools in the United States provide for separate training in children's dentistry. A recent report

gives 23 state health departments as having some form of dental health program. These facts show that progress is being made on both sides of the educational program.

Still we all know that the dental service for children has long been a neglected phase of dentistry. Some say it has been neglected because children are difficult to manage and, too, that the financial returns for service for children do not compensate for the time and effort expended.

As Dr. Neber has pointed out, there is very little difference in handling children and adults. The same horse sense must be applied to the management of both.

The financial returns for preventive service have been smaller than those for restorative service. This situation is due largely to the fact that the public has apparently had a higher appreciation of the restorations than of preventive measures. That in part is due to the failure of the dentist to educate the public with regard to oral health.

Too often, after some explanation of the result of premature loss of deciduous teeth or the result of prolonged retention of deciduous teeth, a parent says, "My dentist never told me that."

Too often also deciduous teeth are spoken of as "temporary teeth." An effort should be made to refrain from using the term "temporary." It suggests that neither time, effort, nor money should be expended.

Until the public can be made to realize that visiting the dentist is not *simply* the question of having an ache stopped or a cavity filled, the problem of educating the adult public will be a rather difficult one. Some methods of dental education other than simple publicity should be sought.

From my observations, I am inclined to believe that *if*, along with teaching preventive measures, the restorative measures receive due attention, worthwhile progress can be attained.

Primary cause which directly or indirectly contributes to malocclusion of the permanent teeth, is clearly traceable to early defects of deciduous teeth. While it is true that some oral deformities precede caries, it will be conceded that the most common beginning of impaired function of the deciduous teeth is due to caries that render the deciduous molars sensitive and painful to chew upon (and function is lost).

The growing recognition of these facts makes me believe that operators must realize the importance of maintaining full function, while constructing restorations for deciduous teeth.

As Dr. Neber says, the ideal time to institute a preventive plan is when children are of preschool age. It has been my experience also that much can be accomplished in operative procedures on children three, four, or five years of age. The fear stimulus at this time seems to be more a part of the patient.

By making a mixture of a good proportion of preventive measures and a good proportion of restorative measures we shall be able to play this rôle of the dentist in promoting and preserving child health.

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PATHOLOGIC INTERPRETATION OF X-RAY FINDINGS*

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WE HAVE arrived at a time in the development of our profession when proper recognition is given to the value of the sciences in the art of practicing dentistry. The reason is quite evident—dental and oral diseases which heretofore were thought to be of purely local origin have been shown to come from metabolic disturbances, blood dyscrasias, and other systemic diseases. In order to treat such conditions successfully one must assume a different attitude from that taken only a few years ago. This especially applies to the science of recognizing disease—diagnosis. Diagnosis today is, in very few dental schools, treated as a separate subject; it is talked about in various courses, but like a fata morgana it is never within practical reach and never taught systematically. It involves a wide knowledge and experience; the diagnostician must be able to interpret laboratory analyses of saliva, blood, and urine, bacteriologic tests, and pathologic reports; he must be able to read roentgen films; and he must have a clear mental picture of the tissue changes brought about by disease—pathology.

All methods of examination are important and may be needed before a diagnosis can be made. One alone should not be relied upon, and this applies particularly to the now so popular roentgen examination. Although it is indisputably one of the most valuable means of detecting abnormalities of the teeth and jaws, it should not be regarded as complete and final. Unfortunately, the ordinary roentgenologist makes not even a pretense of studying the symptoms and history of the patient; he only takes x-ray pictures, and from their disclosure he writes a report. Such a report is not a diagnosis, and it is to be regretted that roentgen examination has become a specialty in its own right. It is only an aid, a tool, one of the several tests that should be at the disposal of the diagnostician, but not accessible to the patient, as it is today through commercial x-ray laboratories.

Not only must roentgen findings be interpreted on a pathologic basis, but x-ray examination should also have a prominent place in the study of pathology. In the past we have employed the microscope alone in the laboratory, but there is no reason why the roentgen method should not be used as well.

The roentgen examination shows the gross involvement of the teeth and jaws best and also the extent to which the pathology has progressed. Generally

*Read before the Pennsylvania State and Philadelphia County Dental Societies, February 5, 1936.

it furnishes indications as to the character of the lesion, whether its effect is localized or diffuse, osteolytic or osteoblastic, odontolytic or odontoblastic; whether it is encapsulated, encysted, expanding, infiltrating, or perforating the bone. The x-ray picture therefore does not indicate specific disease but shows the result of the disease, or its effect on the bone and dental structures.

The microscopic study, on the other hand, gives a clear picture of the actual tissue changes in disease, demonstrating the nature of the lesion and the systemic reaction caused by it. With the microscope we can visualize what is actually going on, and the greater our power to visualize the pathologic processes the better is our concept of disease.

To demonstrate how uncertain and vague the findings by the x-ray method can be, it is only necessary to examine an unusual lesion. This will prove at once that pathologic interpretation is an absolute necessity. Study, for example, the x-ray picture shown in Fig. 1 and ask yourself the question: What is actu-

Fig. 1.—Mandibular second molar of a boy aged twelve years. Tooth presented a defective occlusal fissure. Exploration caused hemorrhage. Roentgen examination shows a radiolucent central defect. Pathologic examination is necessary to make a diagnosis.

ally going on in the tooth which shows the central radiolucent area? The answer can be given only by histologic examination.

The need for keen pathologic thinking is also demonstrated when using a roentgen picture for the diagnosis of pulp disease. We know that the pulp itself is not visible except for calcareous deposits; therefore secondary evidence must be relied upon to obtain the desired information. An enlargement of the periapical space presents such evidence, as it indicates an inflammatory reaction caused by the infected pulp. The finding of an etiologic factor, such as deep primary or secondary caries, or a parodontal pocket reaching close to the apex, signifies, especially if associated with symptoms, that an infection may have traveled either from the cavity via the pulp to the periapical tissue (descending pulpitis) or from the parodontal pocket to the apex and into the root canal (ascending pulpitis).

When bone is involved by disease, the x-ray examination helps first of all to determine whether the effect is of an osteoblastic or osteolytic nature.

The osteoblastic reaction causes new formation of bone. This may be inside the jaw (enostosis, sclerosis of the spongiosa, central osteogenic tumor) or outside of the jaw (exostosis, torus palatinus and mandibulare, osteogenic tumors). In some cases it may be found both inside and outside the bone, as is the case in osteogenic sarcoma. The determination of the actual pathologic process, the question whether the condition is of infectious, tuberculous, syphilitic, or neoplastic nature, requires microscopic study.

The osteolytic reaction causes resorption of bone. The evaluation of the defects caused by this process is more difficult still. The lesions may form an area with an osteitic margin. This means that there is a gradual change from the diseased to the normal without definite demarcation. It is characteristic of infectious resorption, but it may also be caused by an infiltrating tumor (benign giant-cell tumor, carcinoma, and other malignant tumors). A cystic area has a well-defined, radiopaque margin due to incasement of the lesion by a cortical

Fig. 2.—Photograph of an excised mandible with submaxillary glands attached. From a case of carcinoma of the lip metastasizing to the jaw.

layer of bone. This condition is seen in all types of odontogenic and fissural cysts, but may also be encountered in the case of encapsulated central tumors (adamantinoma, fibroma). Any odontogenic connection may favor classification as a follicular or radicular cyst, while multiple occurrence and trabeculation indicate neoplastic disease. It must be remembered, however, that from all kinds of odontogenic cysts adamantinoma or carcinoma may develop without showing the change in the roentgen picture at first. Later notching at the margin or perforation and extension into the neighboring tissue result, and indicate definite local malignancy. The so-called punched-out area is left for consideration. It is a well-defined shadow with a definite margin but no cortical bone surrounding it. When it is seen in dental x-ray pictures, it is often looked at as a much more serious infection than is represented by the indefinite radiolucent area with osteitic margin. This brings out clearly the fallacy of reading x-ray pictures without a background of pathology. The punched-out area means very little pathologically; it has to do with the anatomic involvement of the bone. It

indicates perforation of the thick, dense, and therefore radiopaque cortex of the jaw, and may be caused by dental infection as well as tumors, especially multiple myeloma which also forms such defects in other bones, especially the ribs, calvaria, and jaws.

All this teaches that the x-ray is a valuable aid to show the presence of disease, and that it is useful to disclose the extent of involvement of the teeth and jaws, but that it does not give sufficient evidence to make a final diagnosis. Long continued comparative study of jaw lesions by means of the x-ray examination and the microscope is necessary to increase our diagnostic knowledge. This can be accomplished first by supplying the student with a roentgen film of every case he studies with the microscope, and second by examining excised specimens by means of the x-ray before making the histologic preparations. The value of such a procedure is appreciated when we compare the photograph of an excised mandible of a case of carcinoma of the lip (Fig. 2) with the x-ray of the specimen showing the actual involvement of the bone by metastasis, as seen in Fig. 3.

Fig. 3.—X-ray picture of the specimen in Fig. 2 showing osteolytic defect in body of the mandible, due to the metastatic new formation.

By continued comparison with the actual pathologic processes the interpretation of the various roentgen signs will become more and more accurate. We have already learned that tumors which are either inside or outside the cortex are generally benign, while those which are both inside and out are liable to be malignant. We recognize an indefinite, so-called osteitic margin with extensions away from the main defect to mean spreading into the adjacent bone through infiltration. We know that certain jaw lesions may be part of a generalized disease, such as hyperparathyroidism, xanthomatosis, Paget's disease, acromegaly, generalized osteomyelitis, multiple exostosis, multiple myeloma, and secondary metastatic malignancy and we recognize multiple involvement by extending the roentgen examination to include the skull, the long bones, and the chest. Other definite characteristics have been established and are expressed by the following maxim, which all those who diagnose lesions of any part of the skeleton may well keep in mind: osteomyelitis sequestrates; benign central tumors are encapsulated; malignant tumors infiltrate, expand, and perforate; and luetic lesions present no characteristic picture—syphilis imitates.

47 Bay State Road

CANCER OF THE LIP

General Considerations, Pathology, Clinical Picture, Diagnosis

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ALTHOUGH radium should often be the treatment of choice for the local lesion in cancer of the lip, I am led to believe that by and large the country over cancer of the lip receives on an average at the present time treatment of a poorer type than it did before the advent of radium. The reasons for this are threefold: (1) the advent of radium in the treatment picture allowed men with little understanding of the pathologic necessities of a case to deliver—in a purely local manner—what was advocated in certain circles as the most recent and possibly the best treatment; (2) as radium was developed in this country, one of the leading institutions, from which some of the best work has come, advocated a policy of conservatism as to the neck glands which, when a patient is not properly followed and sometimes even if he is, quite often leads to disaster; (3) and finally, that because of the stress laid upon those newer methods the confidence of the average rather superficially informed therapist was disturbed as to the results that have always been and still are delivered when proper surgery is performed at the ideal time. The condition is so striking here in the Middle West that about one-third of the cases of carcinoma of the lip that one treating cancer sees, present themselves with metastatic glands either considerably enlarged or fixed to the submaxillary part of the mandible and with the history of the local lesion having healed at some previous time (Fig. 1). For the individual patient seeking the wisest treatment this is a deplorable situation, for good treatment of cancer of the lip will yield nearly as high a percentage of permanent cures as that of cancer of the skin, which yields the highest percentage of cures. Epithelioma of the lip as in most other regions should not be treated as a purely local disease. In the case of irradiation at least, what affects the local lesion favorably practically always fails to be lethal for the metastatic lesion.

OCCURRENCE

Statistics vary, but roughly the incidence of cancer of the lower lip is about twenty times greater than cancer of the upper lip (Fig. 2). The disease is at least twenty times more frequent in men than in women (Fig. 3). If one includes only squamous cell epithelioma, the ratio of men to women is nearer 40:1 than 20:1. In Broders' series which included only squamous cell epithelioma there were forty men to one woman. An epithelioma of the upper lip is likely to be of the basal cell type.

PATHOGENESIS

Factors causing prolonged irritation cannot be minimized as predisposing. Broders, however, found only a slight difference in the incidence in smokers

and nonsmokers. Practically all cases, however, have an antecedent history of various kinds of continued irritation or trauma. A definite group of cases follows a seborrheic keratosis. The history of a tendency to a chronically cracked or fissured lip may be obtained. The weather often plays its rôle in this manner. Patches of leucoplakia at the edges of the vermilion border are in many instances precursors (Fig. 4). Old scars such as luetic scars may in rarer instances precede the lesion. Unquestionably, continued trauma, whether chemical, mechanical, or from chronic disease, stands out as a preliminary factor in many individuals who eventually develop an epithelioma of the lip. Broders estimated in his cases that the site of the epithelioma was preceded by some type of chronic inflammation in 63 per cent of his cases.

IMPLANTATION EPITHELIOMA

Rarely one sees an instance of implantation epithelioma to the opposite lip. Supposedly an abrasion or crack in the opposite lip allows implantation of

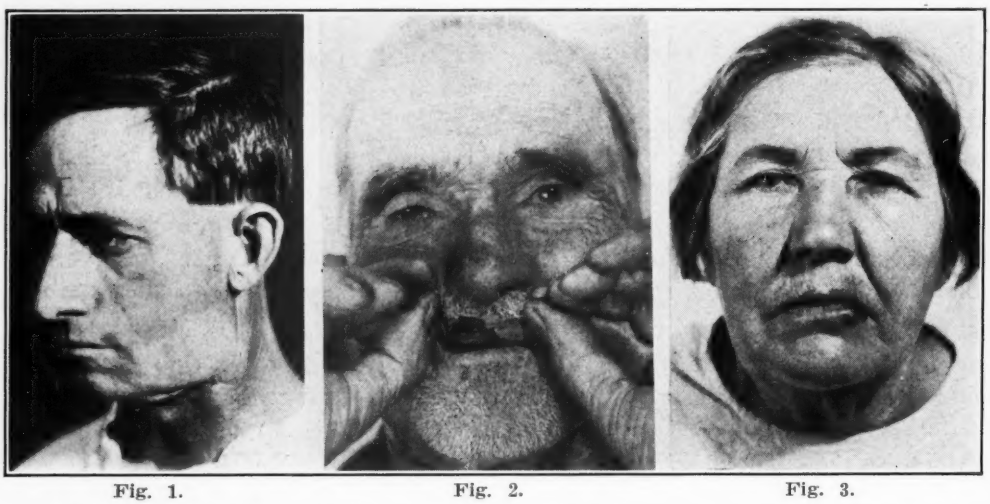


Fig. 1. Fig. 2. Fig. 3.

Fig. 1.—The local lesion on the lip had healed by radium treatment three years previous to the patient's appearance at the hospital with a fixed carcinomatous mass in the left submaxillary region.

Fig. 2.—Cancer of the upper lip, which is twenty times less frequent than cancer of the lower lip.

Fig. 3.—Cancer of the lower lip in a woman. In women cancer of the lip is about twenty times less frequent than in men.

cancer cells from the active lesion to the opposite lip. An alternative explanation, however, for these cases has been suggested by Ewing who points out that both the blood and the lymph vessels encircle the lips.

AGE

Epithelioma of the lip usually occurs after the beginning of the fifth decade of life but may appear in the fourth. Rarely indeed is the lesion seen earlier.

PATHOLOGY

The cellular picture of epithelioma of the lip is usually that of an acanthoma of the prickle cell variety with intercellular bridges (Fig. 10 *A*). Epithelial pearls are usually present, but many variations of detail are seen. In the papil-

lary form, long papillae with or without keratosis project outward. Round cell infiltration and fibrous tissue overgrowth may hinder downward infiltration of the altered papillae for quite a time. In the ulcerating form the downward invasion of the submucosal tissues is more active (Fig. 10 *B*). In some instances the appearance of adult squamous cell epithelioma is soon lost and the projecting columns of epithelial cells appear opaque and polyhedral.

The infiltration tends to follow the lymph channels. The lymph nodes are embolically involved but in most cases not so early as in most other intraoral epitheliomas. Metastasis, however, cannot always be ascertained by physical examination. Several years may elapse before clinical enlargement appears even after the local lesion has been healed. Visceral metastases are rare.

It has been stated that a form of carcinoma occurs on the lips and face having both basal and squamous cell elements. Clinically, it is usually mistaken for a basal cell epithelioma. Microscopic examination distinguishes the type.

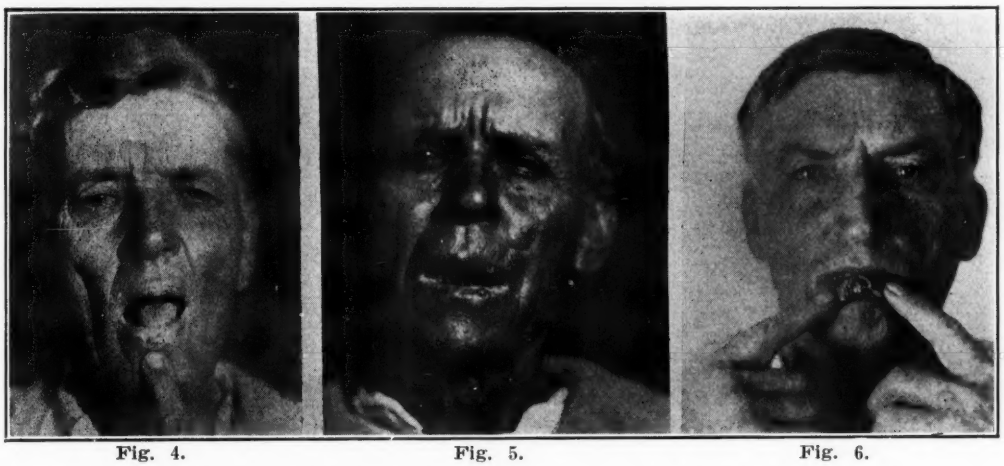


Fig. 4. Fig. 5. Fig. 6.

Fig. 4.—Early Grade I cancer of the lip in a whitish thickened leucoplakic area.

Fig. 5.—Early epithelioma of the lip.

Fig. 6.—More advanced ulcerative type of epithelioma of the lip. More commonly the lesion appears at one side of the midline.

CLINICAL COURSE

One clinical type of lip epithelioma starts as an indurated crack or a flat thickening at the juncture of the skin and vermilion border of the lip to one side of the midline (Fig. 5). The flat induration after the scales or crusts are removed shows some slight ulceration. This chronic scaly ulcer with a little induration in its base and about its edges may persist for several years without signs of much growth. In rare cases metastasis may even appear without the local lesion's showing evidence of active growth. Usually, however, the local lesion is the only lesion seen, as metastasis occurs relatively late in this type of lesion. A second clinical type has more ulceration (Figs. 6 and 7), more thickening of the borders, more induration of the base, and a tendency is shown for the lesion to run around the vermilion border, and eventually the cheek may be affected. Lymph node enlargement is relatively early for epithelioma of the lip in this clinical type, and the whole course is more rapid than the preceding form. More rarely a third type (Fig. 8) of epithelioma of the lip is seen which

begins as a papillary wartlike growth. A slight tendency to extend and infiltrate tissue is noted, and the rapidity of the general clinical course lies midway between the first and the second forms described.

As mentioned, an epithelioma of the lip may appear almost healed in rare instances and then several years later be heralded by distinct evidence of cancer involvement of the tributary lymph nodes. But usually before the lymph nodes of the submental or submaxillary regions are involved, the primary ulcer presents an unmistakable picture. In advanced cases the lip may be partially destroyed or quite widely stiffened by induration. Late surrounding tissues are invaded including the mandible. In those lesions extending toward or involving the angle of the mouth, the cheek may be quite ulcerated and indurated by the invading process. In the terminal stage as in all cancer in and about the mouth, salivation and fetor become pronounced.

Fig. 7. Fig. 8. Fig. 9.

Fig. 7.—More advanced squamous cell epithelioma of the lip.
Fig. 8.—Papillary type of epithelioma of the lip.
Fig. 9.—Basal cell epithelioma of the skin of the lip.

LYMPHATIC DRAINAGE

A working knowledge of the lymphatic drainage of the area about the lips is pertinent. The lymphatics of the upper lip drain to the corresponding submaxillary lymph nodes. The midportion of the lower lip drains to the submental lymph nodes. The outer part of the lower lip drains to the submaxillary lymph nodes. From either group of glands—the submental or submaxillary—metastatic emboli may go directly to the upper deep cervical nodes. Glandular involvement may not run true to form. The submaxillary glands may be involved before the submental or more rarely the upper deep cervical, clinically at least, first of all. Cross glandular involvement, although fortunately fairly rare, is seen. The time of glandular involvement is variable. The average is from nine to twelve months. Three months is quite early, but seven or eight years may intervene after the primary lesion is healed before the submaxillary nodes become involved. Twenty-eight years have been reported as intervening. Three years is not uncommon.

METASTASIS

It is well to emphasize that in the earliest stages one cannot be certain whether or not the lymph nodes are involved. Even the microscope does not always give the information early. Clinically and early it is not always possible to be accurate or positive in many cases even after palpable lymph nodes have developed whether or not the enlargement is due to inflammatory products or to malignant growth or both. Later, however, the continual growth and the hardness make the diagnosis of metastasis rather evident to the practiced observer.

DIAGNOSIS

The ability to understand and to diagnose cancer of the lip is of extreme importance to the dentist. The dentist has occasion to examine the lip and mouth more periodically than the physician. His responsibility is therefore obvious.

The diagnosis of epithelioma of the lip should be made early. When there is doubt, every chronic ulcer, wart, or abrasion of the lips in persons who have reached the cancer age, should be excised and subjected to microscopic study. Even in younger persons, because a malignant lesion at such an age is more dangerous and grows rapidly, the procedure of excising doubtful lesions should be followed. Excision and microscopic examination prove the nature of the growth and at the same time remove it. The resulting scar, if the lip is properly resutured, is practically nil. Often the radiologists treat these lesions with radium without microscopic evidence to prove the nature of the disease. If treatment is all that is aimed for, the method used—surgical or radium—will be one of individual preference, but if certainty of the nature of the growth is also considered of importance, microscopic confirmation will probably give a greater sense of satisfaction to the scientifically minded physician and also offers a safeguard to the patient.

The chronicity of the lesion is important in the diagnosis. A simple ulcer of some weeks' duration or a simple papilloma of the mucocutaneous border of the lip in a patient of cancer age without a definite etiologic background should be regarded as potentially malignant.

In advanced cases, the history, the ulceration, the induration, and evidence of metastasis make up a clinical picture hardly to be compared with any other condition.

(a) *Questionable Lesions.*—To facilitate the handling of questionable lesions of the lip, the late Dr. Bloodgood grouped the early lesions as follows: In Group I are those lesions which are small and persist only a short time, a week or two. They imitate burns, fever blisters, vesicles, keratosis, or warts. They heal under palliative treatment in a week or two. Group II contains lesions of longer duration, such as leucoplakia or chronic chapped lips (Figs. 4 and 5). They are usually benign. Group III contains those lesions which resemble Group I but do not disappear under palliative treatment. These lesions may be benign or malignant. Group IV contains distinctly benign lesions or definite warts. Group V contains those lesions distinctly malignant. Groups III, IV, and V demand immediate biopsy and microscopic examination. In Group III, if a microscopic study is not permitted, a false conclusion may be reached. Often treatment by x-ray or radium leads one to think that an epithelioma has been cured.

(b) *Differential Diagnosis.*—(1) Sometimes a chancre of the lip in a person of the cancer age may rather closely imitate an epithelioma. A chancre is differentiated by the rapidity of appearance, its appearance, the cardboard base induration, and the early rubbery not hard enlargement of the submental and submaxillary lymph nodes, and finally the dark-field examination. Somewhat later, the state of the Wassermann test or the appearance of secondary lesions is important, but the diagnosis should be made before these later manifestations appear.

(2) Basal cell epithelioma of the lip is very rare, and when it is seen it is usually found on the skin and more often on the upper lip than the lower lip (Fig. 9). Clinically, the growth may be flat, nodular, ulcerative, or annular. The edges are characteristically indurated and hard. Before ulceration takes place, the whole growth is firm. After ulceration the edges give a rolled, heaped-up appearance, and often reveal pearly translucent white nodules which are considered to be somewhat pathognomonic. The clinical course is slow. Later the lesion may invade locally; thus, the appellation "rodent ulcer." Metastasis does not occur. Microscopically, the cells are small with round or elliptical nuclei and a limited amount of cytoplasm. Wher the corium is invaded, the outer layer of the branching outgrowths of cells tends to have a palisade arrangement. The diagnosis may in most instances be made by an experienced observer from the clinical picture but should be confirmed by biopsy.

(3) Only rarely does one see a lesion that may be classified as a sarcoma of the lip or face. In the literature is described an occasional tumor which is classified on microscopic study to be a sarcoma or an endothelioma. Clinically the group is characterized by the appearance of a mass beneath the skin or mucosa which grows rapidly and involves and distorts the surrounding soft tissue, and tends finally to necrose and ulcerate. The diagnosis of the particular cell type should be confirmed by biopsy.

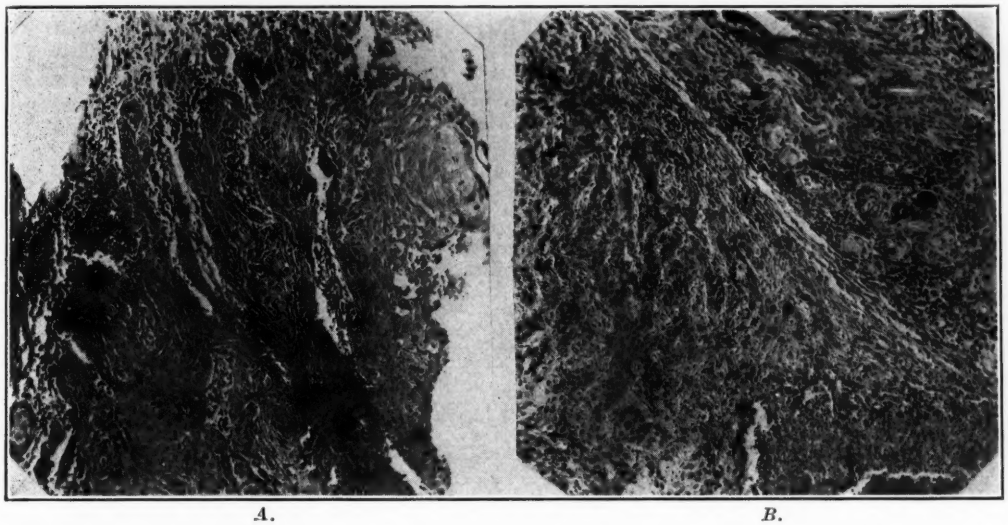
VALUE OF HISTOLOGIC PROGNOSIS IN LIP EPITHELIOMA

Some years ago Broders called especial attention to the conception of cellular differentiation as an aid to prognosis. The idea was not entirely new but had not been emphasized. The conception is based on the theory that the more highly differentiated malignant cells are—the more nearly the appearance is that of a normal cell—and the lower the malignancy index should be. Broders' work was done on carcinoma of the lip and has been quite widely accepted, at least for lesions of the lip. On the other hand, some skepticism has been expressed from time to time. Plaut expressed the opinion that for practical purposes the time is hardly ripe to advocate the method for histologic prognosis in general. In criticizing Broders' data, Plaut states: "The microscopic picture which is supposed to warrant a favorable prognosis is found coincident with other favorable factors as smallness of the tumor and short duration." He goes on to say: "The interpretation of the most used histologic features is so far uncertain. This is true of inflammation in the stroma, and also of the mass relation between epithelium and mesenchyme. Knowledge of cell division in tumors requires much more study with special reference to the occurrence of amitosis of intermediate forms of cell divisions and of different phases of mitosis.

More problems than facts which can be used for histologic prognosis are available. Only the most careful study of individual cases can avail us in the presence of manifold histologic and clinical phases of malignant tumors. Most likely to remain are those of bad prognosis with highly irregular plemorphic structures."

In an analysis of carcinoma of the lip, Lund found that there was evidence that the grade was to some extent an indication of the size of the tumor and that cases tended to become of higher grade as the tumor increased in size. Also he found that in carcinoma of the lip there was a relationship of the duration of the cases before treatment to the presence or absence of metastasis and that the relationship was different in different grades and sizes. There seemed to be a definite tendency to an increase of malignancy as the tumor developed.

My own working rule at the present time—so far as treatment might be influenced thereby (usually it is not)—is to give somewhat greater weight to the



A. *B.*

Fig. 10.—*A*, Photomicrograph of a squamous cell epithelioma of the lip showing keratosis, intracellular bridges, and some round cell infiltration. About a Grade II.

B, Photomicrograph of ulcerating type of squamous cell epithelioma in which the infiltration is rather marked. About a Grade III.

general clinical picture including the length of time the growth has been present and its size, the character of the growth, the age of the patient, and the rapidity of its growth than the microscopic picture. When the clinical picture and the microscopic picture disagree, the clinical picture, if one is familiar with it and a good judge, may be considered as of at least equal importance with the microscopic picture.

TREATMENT

In the treatment of cancer of the lip, surgery, radium in its various forms, and x-ray therapy will have a place. The whole subject of the treatment of epithelioma about the face, mouth, and jaws is a very complicated one and requires extensive knowledge of pathology and the limitations as well as the advantages of surgery, radium, and x-ray therapy. Before it is possible adequately to discuss the treatment of cancer of the lip, the principles of irradiation treat-

ment must needs be discussed and understood. Therefore, it seems best to defer the regional treatment until after the general principles of that treatment are elucidated in their appropriate sections, as the region is not so important as the principle. If one understands the principles involved, application to the region becomes only a variation of a general philosophy entailing a general understanding.

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RED AND GREEN LIGHTS IN ANESTHESIA

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AT NEARLY all important crossroads and street intersections throughout the country the authorities, looking toward the safety of the public, have placed markers indicating to the experienced automobilist and the novice, as well, the advisability of continuing their contemplated course in an uninterrupted fashion or the necessity of stopping, looking, and listening because of possible unforeseen dangers. These markers, or silent policemen, furnish their instructions through the medium of green and red lights. Every driver knows their significance. The wise, careful operator of a high-powered vehicle carefully follows the rules and usually reaches his objective without endangering his passengers. The inexperienced, the negligent, and the carefree frequently violate the accepted code of procedure. Disaster occasionally follows. Reputations are blasted, and the death of an innocent participant is not an infrequent sequence. In general most of these accidents with their untimely sequelae could have been avoided if the man at the controls had adopted a conservative attitude, had thought intelligently before he acted and had followed the instructions so definitely laid down. May we not use this illustration as a guide for the administration of anesthetics in dental operations? In them we are handling agents of great power for beneficient purposes. They may be, however, instruments of destruction. Men adopting their use may be experienced operators and by study and training may have accustomed themselves to their individual potentialities; they may be inexperienced though anxious to learn, or they may be cocksure and unreliable. Too often there are those who take control before they are competent and while unversed in the basic factors which should govern their employment. Safe and intelligent handling offers the prospect of bringing cases to happy conclusions. Hit-and-miss methods invite disastrous consequences, with death frequently hovering in the offing. In this comparison not only is the professional reputation of the individual operator at stake, but frequently the reputation of his confreres is jeopardized.

The yearning of the dental profession to justify itself as a highly developed specialty in the activities of the healing art and to assume an assured corner in the broad field of medicine is nowhere better exemplified than in its efforts to render dental operations painless. The professional attitude has materially changed in recent years, and conduct of practice in this respect is radically different from the not far distant days when pain was considered a necessary adjunct to practically all dental interference. Today both dentist and layman alike know that this is not a fact. The public is demanding that its dentistry be performed with a minimum of discomfort. As a whole, dentistry is living up to that demand. Unfortunate examples of negligent operating occasionally come to light, but in general the profession is intelligently handling the matter.

Magazine articles and textbooks have laid out in detail all the rules for going ahead. The salesmen for anesthetic appliances and agents have pointed out all the green lights along the highway.

At first thought it would appear unnecessary to repeat facts about which so much has already been written, but my experience of almost twenty-five years in this work is that there are many operators who do not keep up with the literature and that each year new, untried men enter the field. Many of these have had but little undergraduate instruction, inadequate postgraduate practice and have not bothered themselves to peruse carefully the voluminous published data.

This short article is intended to emphasize the value of the red signals which are of equal, if not of greater, import than the green lights about which the novice is so enthusiastic.

Of all the accepted anesthetics at our disposal, two are outstanding in their indications and their usefulness—nitrous oxide and oxygen and procaine. There are other agents which are utilizable but their limitations are more outstanding. Among these, ethyl chloride, ether, ethylene, and chloroform have been available for a long period. Among the newer developments, vinyl ether, evipan, and avertin are prominent. A few observations regarding each of these will indicate which signals should be shown to the general practitioner who is not an experienced operator.

Ethyl Chloride.—Applied as a spray, local ischemia may be attained and abscesses lanced or simple uncomplicated deciduous extractions executed. Pronounced or prolonged freezing of tissue interrupts circulation, however, and healing may be retarded. By inhalation primary anesthesia may be established and momentary operations performed. It is a dangerous procedure to carry the patient beyond the initial stage, for the drug is highly toxic and respiration is easily embarrassed. This method is used very successfully in children's clinics where much work of this character must be accomplished in a short space of time, where there are not facilities for after care following narcosis, and where the operations themselves do not require more extensive anesthesia. Sufficient depth cannot be safely attained to justify its employment on adult patients.

Ether.—Ether is strictly a hospital anesthetic. Its employment in office practice is against the rules of safety and good judgment and should be deprecated except in emergency cases where conditions fully warrant it. A comprehensive physical examination should precede its use. This can be made only by a physician who alone is capable of discovering its contraindications. Preliminary medication is usually advised, and the effects of this together with the slow elimination of the anesthetic itself make it obligatory that the patient be placed in bed under expert nursing care.

The possibilities of lung, bronchial, or kidney complications are always present. Since the patient is nonambulatory and often requires more medical supervision than immediate postoperative dental attention, the dental office does not meet the situation. As minor considerations the odor of ether is disagreeable, and patients need not be subjected to its irritating fumes nor to its

nausea provoking qualities. The office routine is upset for a long period. If ether becomes the anesthetic choice, we should heed the voice of experience.

Ethylene.—There are no green lights for this agent except in a hospital. The only justifiable claim made for it is that of greater relaxation than nitrous oxide offers. To the anesthetist experienced in nitrous oxide and oxygen this argument does not neutralize the well-established facts that its odor is unpleasant, that it causes more nausea, and that postoperative recovery is delayed. It is akin to ether in its slow elimination as it too attacks the lipoids. Its explosibility renders it dangerous in a dental office, and it presents no advantages to offset this one factor.

Chloroform.—A sentence is sufficient to cover the present-day status of this powerful and once popular drug. Lundy epitomizes expert opinion when he writes, "The use of chloroform by the dental surgeon, unless there is no other available anesthetic, cannot at this time be justified." (J. A. D. A. **22**: 1912, 1935.)

Vinethene; Vinyl Ether.—This has been in clinical use for two years or more. It may prove a boon for short dental operations particularly when an inhalation anesthetic is essential, nitrous oxide and oxygen is not available, and hospitalization unnecessary. The open drop method is usually employed. Recovery is rapid. The odor is unpleasant. The employment of this anesthetic by the dentist should be prefaced by a thorough study of its properties and an ample clinical experience in its administration. Apparently it offers no advantages over nitrous oxide and oxygen except its inexpensiveness.

Evipan.—Like vinethene this newly developed drug requires no costly paraphernalia. It offers the advantages of complete relaxation and quick recovery. A moderate dosage is usually ample for dental cases, but anesthesia may be prolonged by continuing the administration. The dosage is empirical, however, and is governed by the clinical signs. The anesthesia develops very quickly, and operative plans must be made in advance with all instruments in readiness, the mouth prop in place before induction is instituted, and the throat pack at hand. The dentist must be capable of making an intravenous injection, as it is by this means that unconsciousness is instituted. There is no definite antidote to neutralize overmedication.

The reports to date have been very favorable. Those who have used it most are enthusiastic about it. The red light warning is that one should develop technic and experience in its employment under the tutelage of a person expert in its use.

Avertin.—Undoubtedly this agent has made its place among the hospital anesthetics. It must be ruled out of consideration as an office anesthetic. Its administration is not in the dental field.

Having thus briefly commented on the virtues and limitations of the above mentioned anesthetics, we now come to a consideration of the two which justifiably have the greatest appeal to the dental profession because of their wide range of usefulness, their relative safety, and their superlative adaptability in office procedure. These are procaine and nitrous oxide and oxygen. Neither of them is indicated in all cases, but between them they offer everything needed for a satisfactory solution of the anesthetic problems of the profession in the dental

office. Failures recorded against them and disastrous results following their employment have been due not primarily to inherent qualities in the drugs themselves but to certain definite limitations which were unrecognized, their employment in the face of well-established contraindications, faulty technic on the part of the operators themselves, or a combination of these factors.

If we temper our enthusiasm in looking for and hurriedly adapting the new and concentrate on developing the possibilities of such tried and true friends, we shall the sooner approximate our ideals in the praiseworthy combat against the dominance of pain.

In no phase of our procedure have the rules of the road been more lucidly laid out, but regretfully it must be stated that these rules are frequently violated. We again emphasize the *red* lights.

Procaine, if administered properly, produces a satisfactory local anesthesia and the patient may be rendered free from actual pain. He is cognizant of all operative manipulations, however, and if temperamental, nervous or high strung, may mistranslate the sensations engendered. His mental faculties are in high gear, and psychic shock must be reckoned with. The phlegmatic types react best to this agent, and as a general rule the high tension individual is not a good subject for operations of a surgical character unless narcosis is induced.

Among these overstimulated patients we may note children, people who have been undergoing sleepless nights, the neurotics, and those who, due to some previous uncomfortable experience in the dental chair, look forward with definite fear to further expected agonies.

The considerate dentist recognizes these complexes and by tact, assurance, and a supportive kindly attitude, backed up by a definite ability to make good his words, can do much to iron out these difficulties. Tangible aids in their solution include intelligent premedication, the use of topical obtundents to eliminate the universally dreaded sensation of the needle prick, a sharp needle, a slow injection into vascular tissue without undue pressure, and a lesser dosage of the epinephrine content than is generally employed. The operator himself must realize the limitations of his agent and not entertain the thought of employing it in the face of proved contraindications. These should be so well known that it is unnecessary to enumerate them. We are impelled to reiterate, however, that these injections must be sterilely executed, that infiltration anesthesia will not satisfactorily desensitize posterior mandibular teeth, that no injections should be made in infected areas, that in cases of trismus and cellulitis we are calling on the drug to perform beyond its capabilities, and that broken needles in tissue do not make satisfied patients.

Nitrous Oxide and Oxygen.—In the combination of these gases we have a very flexible anesthetic and all things considered a most suitable one for the dental office. It is considered the safest of all general anesthetics because of its rapid elimination and because the ideal resuscitant, oxygen, is administered in combination and is at our immediate disposal for ventilation. The borderline between safety and danger, and good and poor anesthesia, is narrow, and to utilize it successfully requires much experience and infinite attention to detail.

The ideal narcosis is developed when the gases are so combined that the patient placidly sleeps. This necessitates the right proportion of nitrous oxide

to anesthetize and just the amount of oxygen to satisfy the ever-changing metabolic demands, with sufficient pressure to meet the individual requirements. Naturally then it is difficult to obtain a smooth narcotic slumber unless the anesthetist is thoroughly versed in anesthetic signs and the danger signals and is alert enough to forestall the latter before they become firmly established.

When dealing with overstimulated patients it is often indicated and sometimes essential to premedicate. The barbiturates are much in favor today for this purpose and certainly have advantages over morphine in office work. Nembutal is the agent of choice among many operators. If any of these drugs are employed, pre- or postoperative arrangements should be made to see that the patient safely reaches home.

Premedication is not a necessary routine for the dentist who thoroughly understands the handling of his anesthetic.

To facilitate smooth narcosis it is imperative that airways are clear. This suggests the proper position of the patient in the chair and teamwork between anesthetist and operator. The proper extending of the chin is one of the duties of the former, and on the latter rests the responsibility of avoiding undue depression of the mandible and the proper placing of the throat pack in relation to the tongue and pharynx. Operating without a well-adjusted throat pack constitutes negligence, and any one attempting to do so puts himself in a precarious situation. Many a lung abscess and many a tracheotomy could have been avoided if this apparently small detail had been attended to.

No one person can safely and satisfactorily administer gas and oxygen and operate at the same time. This is definitely a two-person job and not only that, but one for which the two participants should be expert and accustomed to working together. Some of the unwarranted results on record are due to inviting the aid of a relative, a bystander, or the girl across the hall to hold the inhaler for a "whiff of gas." The ideal arrangement is reached by the united performance of an operator, an anesthetist, and at least one operating assistant, each one thoroughly knowing his duties. Finally the days of "knock-down and drag-out" nitrous oxide asphyxias should be over, and the public knows it.

270 Commonwealth Avenue

A CASE OF GENERALIZED OSTEITIS FIBROSA DEMONSTRATING THE EFFECT OF HYPERPARATHYROIDISM ON TOOTH DEVELOPMENT*

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HYPERPARATHYROIDISM has been produced experimentally by Bauer, Aub, and Albright,[1] who injected parathyroid extract into young animals and produced bone changes. Jaffe, Bodansky, and Blair[2] demonstrated histologically in guinea pigs that subcutaneous injection of parathormone produces severe and rapid decalcification of the skeleton, associated with bone resorption and fibrosis of the marrow. In the later stage, osteoclastomas (giant-cell tumors) and cysts occur, but only if the destructive changes are severe enough.

In man the disease is spoken of as generalized osteitis fibrosa and has been carefully studied by Hunter and Aub,[3] Hunter and Turnbull,[4] Gutman, Swenson, and Parsons,[5] and I have studied the condition of the jaws.[6] Before the discovery of hyperparathyroidism as the etiologic factor in generalized osteitis fibrosa, cases of this kind were often diagnosed as osteomalacia, rickets with giant-cell sarcoma, or multiple giant-cell tumors. Often the convenient but nondescriptive term, von Recklinghausen's disease, was used.

Generalized osteitis fibrosa is a slowly developing disease, more common in women than in men, occurring generally between the ages of thirty-five and forty-five years. The case to be reported, however, occurred in a boy fifteen years old. The disease may be latent for a long time, but during its progress it causes in the bones symptoms of pain of a rheumatic type, and patients are often first treated for rheumatism. Common complaints of fatigue and muscular weakness indicate a generally lowered excitability of the muscles.

Blood Picture.—There is hypercalcemia, and frequently the blood phosphorus is lowered. Serum calcium (normal 9.0 to 11.0 mg. per 100 c.c. blood serum) varies between 12.6 and 23.6 mg.; plasma phosphorus (normal 2.5 to 3.5 mg.) is 1.0 to 2.7 mg. In addition, the blood phosphatase (normal 0.1 to 0.2) is elevated to 1.1 and even 2.5 units (Kay). Phosphatase is increased in rickets, osteomalacia, and Paget's disease, as well as in generalized osteitis fibrosa.

Urinalysis.—Increased secretion from the parathyroid gland (hypertrophy or tumor) causes increased excretion of calcium and phosphorus in the urine. The output of calcium is often eight times the normal amount. Albright and Ellsworth[7] postulate the blood syndrome of hyperparathyroidism as a lowering of the renal threshold for phosphorus. According to them, in the development of hyperparathyroidism the first effect is an increased phosphorus excretion in the urine; this results in a decreased serum inorganic phosphorus and

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tends to leave the serum's capacity to take up calcium phosphate unfilled. Calcium phosphate is then mobilized from the bones to meet this deficit, but this results simultaneously in a considerable increase in blood calcium which is excreted through the urine.

Bone Changes.—Decalcification is the primary feature in the skeleton. This is seen in the roentgen examination as a distinct mottling (osteoporosis). Later the bones become extremely radiolucent when compared with those of a normal person of the same weight and age. The bones are soft and there may be disabling deformities. The bones most frequently involved in generalized osteitis fibrosa are, in order of incidence, the long bones, calvaria, mandible, maxilla, pelvis, and phalanges. The skull almost regularly shows changes of some sort.

In the jaws osteoclastic resorption and fibrosis of the spongiosa are common features, and frequently peripheral and central giant-cell tumors occur; the antrum may be involved. In some cases the chief complaint is one of these oral

Fig. 1.—Roentgenogram of mandible showing diffuse radiolucency of bone due to osteoclasia.

conditions, and the patient may seek the advice of the oral surgeon first, who may or may not recognize the general disease, often treating only the local condition without satisfactory results.

CASE REPORT

G. M. Boy, aged fifteen years.

Chief Complaint.—Swelling on the buccal aspect of the alveolar process on the right maxilla in the molar region.

Family History.—The father and the mother are living and well; there are no other children. No familial diseases.

Past History.—The patient, a schoolboy, stands high in his class in spite of considerable illness. He has "never been strong." He is subject to exanthema, "bilious spells" when taking cream or cocoa since eight weeks old, and had whooping cough and erysipelas when three years old. His mother thought he was paralyzed, and he has not walked well since and has complained fre-

quently of rheumatic pains. At the age of three years he fell from his mother's arms; at ten years he fell from a stone wall, breaking two front teeth. For the last three to four years he has had spells when he was sick from two to three days with anorexia, malaise, fever, nausea and vomiting, starting when he was nervous and excited.

He has been troubled with nocturnal incontinence as long as he can remember, suffers excessive thirst, and has lost weight (best weight 88 pounds, last weight 66½ pounds).

Present Illness.—Two months age he noticed a swelling on the right side of the maxilla. He thought it was a gumboil and was sent to the dental clinic. A tumor was excised and diagnosed as peripheral benign giant-cell tumor. On account of recurrence of the growth a second operation had been performed including the removal of the right maxillary first molar, first and second premolars with a considerable amount of bone.

Fig. 2.—Photomicrograph of alveolar bone showing osteoclastic resorption. In another area osteoblastic activity is marked. The marrow shows evidence of fibrosis, and there is thrombosis of the vessels with formation of hemosiderin.

Physical Examination.—Patient had lost weight and had weakness especially in his legs. He presented a mass, 5 by 3 cm., in the left neck which moved when swallowing and seemed attached at the left lobe of the thyroid. He also had a painless lump at the inner end of the left clavicle, and complained of swollen ankles.

Roentgen Examination (Dr. Sosman, Peter Bent Brigham Hospital).—This suggested strongly a generalized osteoporosis with uniform coarse mottling of the skull and several small cystic areas. The long bones and ribs also showed evidence of decalcification. There were definite radiolucent places in the jaws not due to dental infection (Fig. 1). The teeth appeared well calcified; there was no evidence of caries, and only one tooth was filled. These findings were suggestive of generalized osteitis fibrosa.

Laboratory Examination.—Calcium metabolism was advised and the following is a report by Dr. Aub (Huntington Memorial Hospital):

Serum calcium	19.4	mg. per 100 c.c.
Serum phosphorus	4.0	mg. per 100 c.c.
Nonprotein nitrogen	39.0	mg. per 100 c.c.
Plasma phosphatase	0.69	units (Kay)

Urine showed a trace of albumin with a moderate number of pus cells and a few granular casts. Specific gravity 1.005 to 1.011.

Fig. 3.—Photomicrograph of second premolar showing contour lines produced by interrupted dentin formation.

Blood showed evidence of secondary anemia; red cells 3,610,000; white cells 11,600; hemoglobin 65 per cent (Sahli); platelets reduced, slight achromia with a few stippled cells.

PATHOLOGIC EXAMINATION

Pathology of Bone From Jaws.—It is not intended to give a detailed description of the skeletal changes, since this paper is concerned principally with the jaws and the teeth. Bone from around the extracted teeth was examined and showed active fibrosis of the marrow with edema and cyst formation. The blood vessels were enlarged and contained hemosiderin. There was marked osteoclastic activity indicating active bone resorption. Evidence of apposition

was indicated by trabeculae surrounded by osteoblasts of extremely large size, and in some instances arranged in double rows. This indicated an attempt at repair. All these changes can be seen in Fig. 2.

Pathology of the Teeth.—Of the three maxillary teeth received, the two premolars showed similar changes; they both underwent development during the active phases of the disease. The molar, completely formed at the age of nine years, is described separately. When the specimens were received, if it had been known that the boy was suffering from hyperparathyroidism one tooth would have been used to prepare ground sections to study the enamel; however, all the teeth were decalcified to be cut in celloidin. Gross appearance revealed no enamel defects.

About 100 sections of the premolars were studied. These had alveolar bone attached, undergoing marked osteoclastic resorption with the typical picture of osteitis fibrosa described above. The periodontal membrane showed enlarged

Fig. 4.—Photomicrograph of first premolar showing contour lines and detachment of the last deposited secondary dentin.

blood vessels containing thrombi with hemosiderin, but no osteoclasts or giant cells. The surface of the cementum was irregular with evidence of hypercementosis. The dentin showed the most marked effect of the disease. Interruption of tooth formation left permanent records, seen as well-marked, intensely stained contour lines. The most prominent one appeared at the time when the roots were about half formed (Fig. 3), but several others could be recognized. The disturbance in dentin genesis was so marked that the resumption of dentin formation, when it later occurred, produced incomplete union, evidenced by a tendency of the newer tissue to separate from the older (Fig. 4). The dentin showed many imperfections, especially in the region of the contour lines, where the dentinal canals were interrupted, and generally continued at an angle in the tissue deposited later. It is important to note that there was no evidence of dentin resorption.

The pulps of the premolars showed enlarged blood vessels with thrombi in some instances but no hemosiderin deposited, and there was no extravasation

either of leucocytes or of blood corpuscles. In one of the teeth part of the pulp showed evidence of fibrosis, and there were places where vacuolation and atrophy of the odontoblasts had occurred; here osteodentin had been deposited.

The molar alone showed evidence of resorption but only on the external surface of the roots. The resorption, however, occurred on the surface of the buccal roots, which, because of the destruction of the alveolar plate, were in contact with the peripheral giant-cell tumor. The resorption was evidenced by

Fig. 5.—Photomicrograph of first permanent molar showing surface of the root which had been in contact with giant-cell tumor. Giant cells (osteoclasts) are seen in lacunae, indicating resorption. *P*, periodontal membrane; *T*, tooth.

lacunae extending deep into the dentin and containing osteoclasts (Fig. 5). Other parts of the roots and especially the crotch of the tooth presented evidence of hypercementosis. The pulp showed changes similar to those in the premolars. Interstitial deposits of calcium and pulp nodules were abundant. This was probably due to the marked increase in blood calcium, which also is the cause of the renal calculi common in hyperparathyroidism. Several layers of recently formed secondary dentin could be distinguished. They were separated by contour lines similar to those seen in the premolars. At places where

odontoblasts persisted, the dentin was of the tubular variety, while at other places where they had been destroyed, and where vacuoles had formed along the dentinal wall, osteodentin was produced (Fig. 6).

SUMMARY

The effect of hyperparathyroidism on the developing teeth of a young patient (aged fifteen) suffering from generalized osteitis fibrosa has been studied.

Although the mandible, as well as the maxilla, was extensively affected by the disease and the teeth were surrounded by bone showing marked resorption, there was no evidence of resorption inside of the teeth. Contrarily, the unusually good teeth with no cavities and only one filling, as well as the formation of pulp stones, point to the fact that due to the hypercalcemia the calcification of the dental structures is increased rather than depleted.

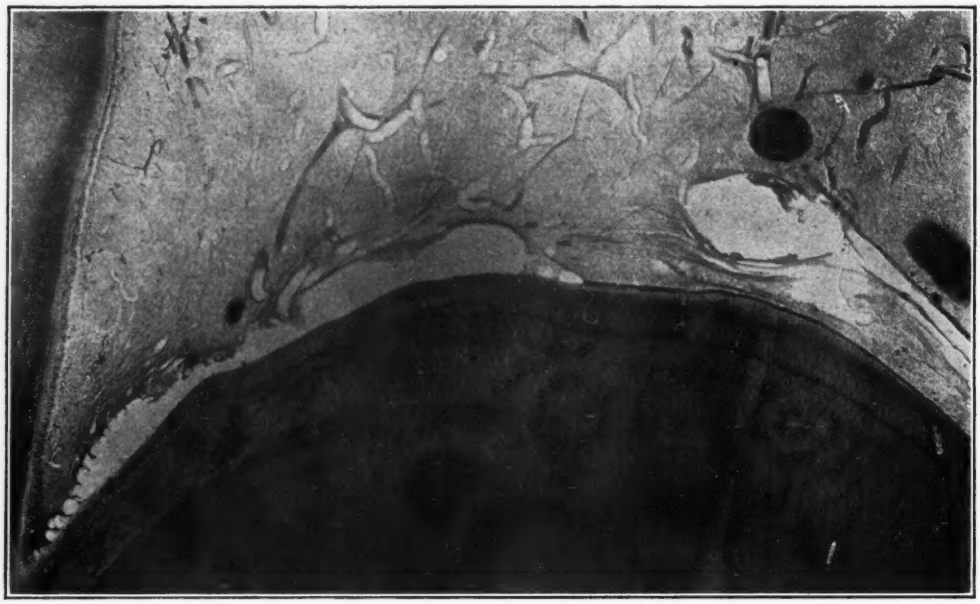

Fig. 6.—Photomicrograph of first permanent molar, region of the floor of pulp chamber. On the right, a normal layer of odontoblasts is seen with deposit of tubular dentin. On the left, the odontoblasts have disappeared, vacuoles give evidence of edema, and the dentin deposited here is of the osteodentin type. Pulp hyperemia and cyst formation are shown, and pulp nodules are in evidence.

The most striking effects of hyperparathyroidism are as follows: (1) interruption of the tooth development, producing marked defects in dentin formation, seen as deeply stained contour lines, which are probably records of very severe or active phases of the disease; (2) formation of osteodentin, produced when odontoblasts are destroyed; and (3) formation of osteocementum deposited at the root surfaces in excessive amounts. A completed tooth in a person who has contracted the disease in later life would probably show none of these changes in the dentin.

It may be concluded that teeth present a very stable deposit of calcium, which is not readily resorbed, because it was not affected in this severe case of hyperparathyroidism. This is in line with the findings of Bauer, Aub and Albright[1] who state that the bone trabeculae serve as the most available source of

calcium. It also concurs with the statement of Jaffe, Bodansky, and Blair[8] that labile calcium is found in the regions of most active bone growth. There is no continuous resorption and apposition in the adult tooth as there normally is in bone; therefore calcium salts are not readily available from this source.

Since calcium is not resorbed from dentin in hyperparathyroidism, the further conclusion may be drawn that resorption does not occur in other systemic diseases such as pregnancy, osteomalacia, or diseases due to avitaminosis.

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47 Bay State Road

CYSTS OF THE JAWS

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IN OUR proper approach to the treatment of these oral surgical conditions, we should assume the same responsibilities that the general surgeon assumes with regard to his major operations. The proper treatment of cysts, in addition to those of the surgeon's responsibilities, are also those concerned with esthetic factors and physiologic function. Treatment of these conditions involves more than mere technical performance. We should bear in mind the patient's esthetic appearance and also consequent unsatisfactory surgical end-results. As surgeons, we should also bear in mind the psychologic aftermath for such a patient when he reminds himself of the possible good results which might have been obtained were the correct treatment instituted which would not have disfigured his face and jaws. It leaves a lasting impression on such a patient.

The surgeon today considers his patient as a human being and does not ignore his psychologic reactions. We should bear in mind the need of maintaining oral function, and plan our operative procedure accordingly. This concept of surgery and its tendency to take into consideration the psychologic and physiologic factors of treatment have recently been stressed in an address by Dr. Korshet, before the California State Dental Association. His remarks might well serve as a guide in our treatment of cysts:

"A disordered function in one organ means disordered functions in other organs, and this, in turn, means a general disorder of the human machine. No matter how specialized a surgeon becomes he must never lose sight of the human body in its entirety.

"Consequently, the first consideration of the modern surgeon is restoration or improvement of function. An organ completely destroyed by disease should be completely removed. An organ partially damaged should be removed partially, and restored to its function, even if limited, on the principle that half a loaf is better than none at all. The rôle of the modern surgeon is that of benevolent restoration, rather than ruthless extirpation."

For our purposes, we may consider mucous cysts, ranula, and cysts of the salivary glands as belonging to those of the soft structures. There are also cysts associated with the dental and bone structures. The significant clinical characteristics and symptoms of these oral tumors are that in the early stages they present no guiding symptoms, such as pain, inflammatory reactions, etc. In the later stages, pain is present as a result of the acute inflammatory conditions, pressure on the nerves, and also the secondary infections that follow. It may be pointed out that cysts have so far not been correlated directly with systemic disorders as has been done in the studies of pyorrhea and pulpless teeth with focal infection.

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While there is a protective mechanism present in these cysts, forming a defensive wall against systemic invasion (and this is an important point to bear in mind as far as the patient's general reaction is concerned), the operator should be aware that in certain cases of cysts where a definite diagnosis is not made, a malignant growth may be present. In all instances the dentist should be familiar with the nature, clinical type of cyst, and the differential diagnosis.

It is now generally agreed that cysts of the jaws are cavities in the bone substance having a definite wall or capsule, separating it from the surrounding tissue, containing a fluid, semifluid or solid or a combination of the three. These may be observed in the maxilla or in the mandible. From a clinical and practical standpoint we recognize two major types which command attention for detailed study, namely, the radicular or dental root cysts and the follicular, or

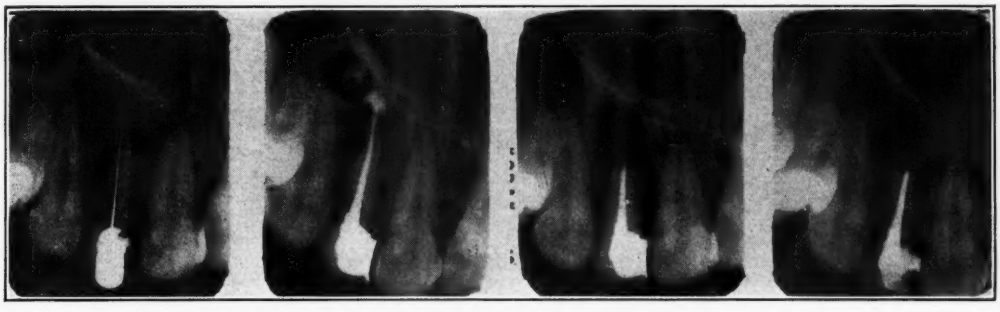

Fig. 1.—Type of case in which conservative treatment may be instituted.

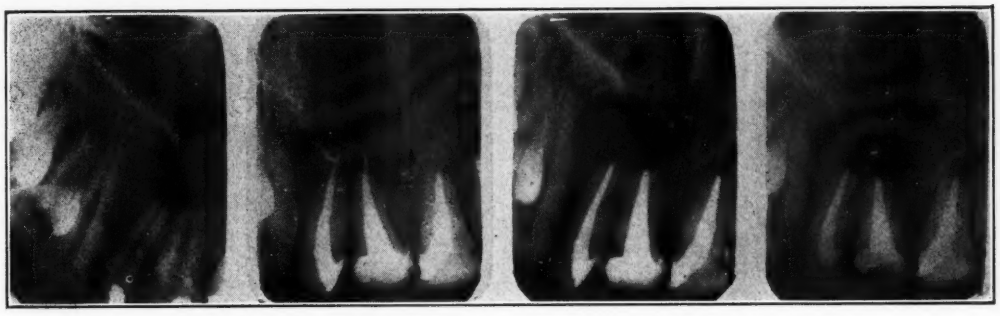

Fig. 2.—Another illustration of success in conservative treatment.

dentigerous cysts. In our study of radicular root cysts, it is desirable that we give some attention to granulomas. These also present pathologic conditions associated with periapical dental infection as observed in dental root infection.

On the other hand, we shall deal also with another condition which presents significant characteristics of cysts but which should be studied, belonging to a distinct group. I refer to the multilocular cyst, also designated as adamantinoma. The adamantinomas, although more rare as compared with the two major groups of cysts, should be investigated more fully with respect to conservative and radical treatment; since they present features of considerable importance in differential diagnosis. From a diagnostic standpoint we are interested also in a number of mouth conditions that simulate cysts but which do not fall in any of the types here enumerated. Osteitis fibrosa cystica is a typical illustration of a group of such conditions which we are called upon to diagnose and treat.

In presenting the subject of cysts of the jaws under these four headings:

1. Granulomas
2. Radicular or dental root cysts
3. Dentigerous or follicular cysts
4. Adamantinomas or multilocular cysts,

we are attempting to deal with this group of oral diseases in a category distinct from mouth tumors. Our aim is to emphasize the limitation of our diagnostic aids in this group of disorders. Cysts of the jaws may be diagnosed clinically, radiographically, and pathologically. Of the three, the radiograph is a convenient, although not totally dependable, means of diagnosis. We shall review the characteristic symptoms of various cysts, discuss their etiology, and point out the diagnosis of various conditions and the corresponding treatment. The illustrations are presented to emphasize the important rôle the radiograph plays in diagnosis and as a guide to treatment.

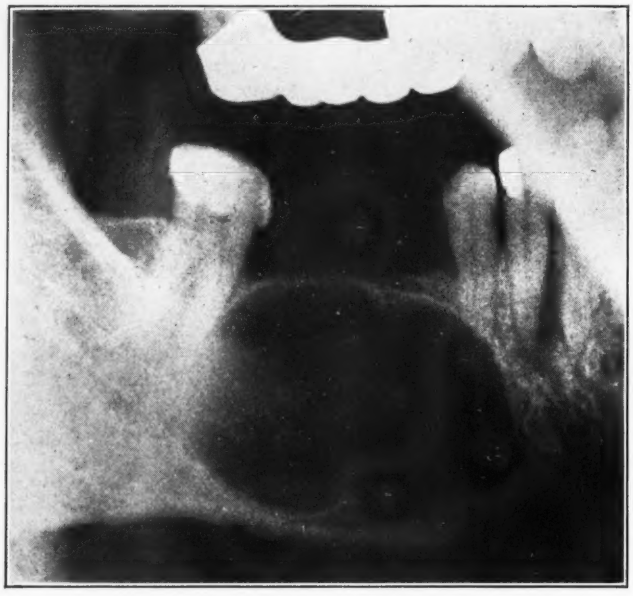

Fig. 3.—Radicular cyst of mandible.

GRANULOMAS

Dental root or radicular cysts, occurring in the anterior portion of the mouth, over the apices of the incisors and canines in both jaws, may be treated by conservative surgery. The method of treatment is determined by the condition of the bone in the region extending from the gingival margin to the apex. When this portion of the bone is intact, root canal therapy should be instituted first, and the area subsequently opened and the cyst enucleated. Other methods of treatment are discussed later.

The chief cause for cyst development is to be found in the individual disposition. This is confirmed by the fact that we observe many patients who in spite of having many teeth which are pulpless, never present cystic conditions of either the radicular type or the follicular type. On the other hand, we have seen patients who developed root cysts on nearly every tooth in which the pulp is nonvital, or where the retained tooth rudiments formed cysts.

DIFFERENTIAL DIAGNOSIS

Knowledge of cysts of the jaws dates back over a hundred years. Since that time various authorities have simplified and clarified our knowledge. All cysts owe their origin to the epithelial tooth border. Radicular or dental root cysts develop from the paradental débris of Malassez. The follicular cysts arise from the epithelium of the follicles.

Dental root cysts usually develop within the alveolar process, and only very large cysts involve the adjacent regions, whereas follicular cysts are found at all points on the maxilla and the mandible. Sometimes, greater diagnostic difficulties are encountered in dental root cysts which are of extraordinary size. In such cases the location of the cyst in the alveolar process and the presence of a pulpless tooth or root serve as indicators of the genesis.

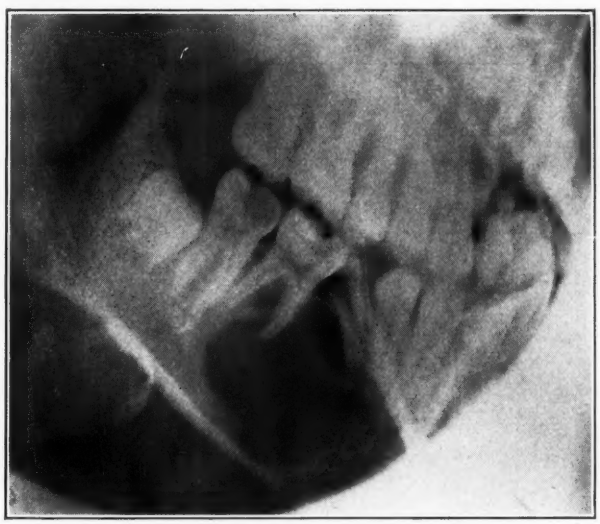

Fig. 4.—Radicular cyst of mandible.

An examination with an electric pulp tester, to determine the vitality of those teeth whose roots project into the cyst, augmented with a radiograph which will clearly reveal the cystic tooth, is an invaluable guide to a definite diagnosis.

A swelling, particularly in the palate, may present difficulties in a correct diagnosis. Pain, the duration of the development, location, the findings from a test puncture, and a radiogram will materially aid in a differential diagnosis.

FOLLICULAR OR DENTIGEROUS CYSTS

Dentigerous cysts are found more commonly in the maxilla than in the mandible. The retention of a tooth is a predisposing cause of the formation of a follicular cyst. Supernumerary teeth are also found more frequently in the maxilla than in the mandible.

Inasmuch as these follicular cysts do not produce pain, their growth may go on in the interior of the jaw for years without notice. As they increase in size, they gradually distend and attenuate the bone until it finally has but an eggshell-like consistency. When the tumor becomes visible externally at this stage, it projects from the jaw. It is marked by sharp borders. If the softening of the

bone has progressed sufficiently, a sharp-edged bone may be noticed by palpating at the highest point of the swelling. A pulsation of the cystic sac can sometimes be felt when the parchmentlike crepitation will clearly be detected at this time. The faint bluish glossy appearance of the cyst can be seen through the mucous membrane covering the tumor.

Cysts tend to develop in the direction of least resistance. In this development they usually form a convexity in the buccal wall in the mandible, and in the buccal or palatal wall in the maxilla, according to their place of origin. Cysts emanating from the maxillary bicuspids or molars usually project into the antrum of Highmore; they are even able to embrace most of the maxillary cavity so that ultimately this cavity is confined to only a small area. In the mandible they occur mostly on the angle of the mandible and on the ascending ramus. The latter, which always emanate from the third molars, deserve special consideration.

Fig. 5.—Radicular cyst of maxilla.

DIFFERENTIAL DIAGNOSIS

The cystic content consists of a serous, slightly mucous fluid. Fat is always present. Cholesterin is not present as often as in dental root cysts; however, more frequently than is generally assumed. When the content appears purulent or filthy, it is due to some external infection, such as may be caused by surgical measures (a puncture or an incision). Infection of the cystic content can also be caused by adjacent granulomas.

On account of their location and size, follicular cysts may be wrongly diagnosed. Through perforation of the antrum of Highmore or the nose, they are sometimes erroneously diagnosed as empyema of the antrum, especially if the cystic content contains pus; otherwise complications are only rarely observed.

CYSTS AND MALIGNANT GROWTHS

To make a differential diagnosis of cysts and malignant growths is generally not difficult. Malignant tumors, such as sarcomas and carcinomas, grow faster

than do follicular cysts. These tumors have an irregular, humpy structure accompanied by an ulcerated surface. Contrasted with this clinical appearance of tumors, there are the smooth, sharp-edge surface of cysts. In tumors the swelling of the regional lymph glands occurs, and in the advanced stages of the disease cachexia is present. In cysts the lymph gland affections are seldom present, and cachexia is never encountered. In contrast to cysts, malignant tumors do not confine themselves to their own structures but involve the adjacent tissues as well. In spite of these distinguishing features, cases have been reported in which the diagnosis seemed dubious. A good radiogram and possibly a test puncture and biopsy will in most cases enable the operator to make a correct diagnosis.

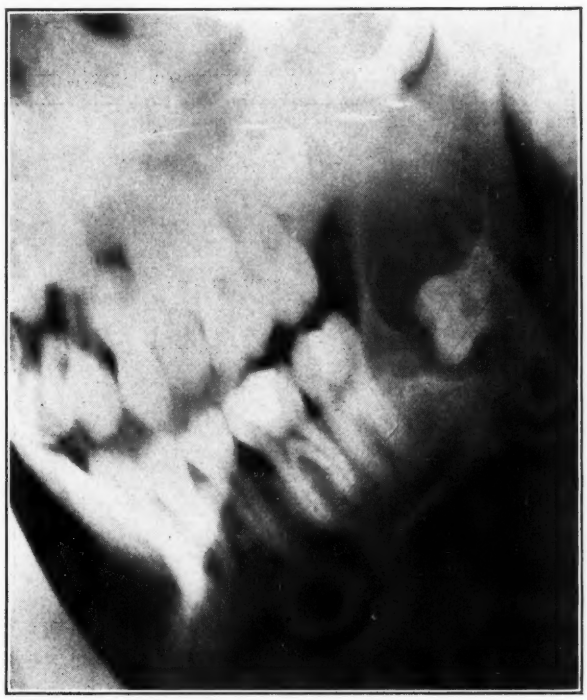

Fig. 6.—Follicular cyst of mandible.

Cysts which project into the antrum frequently, as always pointed out, give rise to confused difficulties in diagnosis. The clinical test irrigations, illuminations, or the radiograph taken together will aid one in establishing a diagnosis.

PROGNOSIS

The prognosis in follicular cysts is favorable. These cysts confine themselves to their parent structure, namely, the jaw bone, and do not encroach upon adjacent tissues. The complications which may arise in the process of formation of a follicular cyst are not of such a nature as to influence the prognosis greatly. In the earlier methods employed in the treatment of follicular cysts, where invariably jaw resection was performed, the prognosis was naturally much more unfavorable since the treatment resulted in a partial mutilation of the patient.

METHODS OF TREATMENT

Three distinct methods of treatment may be employed in the treatment of cysts, as follows:

1. Where upon digital palpation there is no evidence of fluctuation and cystic formation is determined by means of a radiogram, we employ the following method. An incision is made through the mucous membrane and periosteum directly to the bone. The mucoperiosteal flap is elevated, the hard overlying bone is also removed by the aid of chisels, and the cyst is enucleated. All sharp edges of the bone are made smooth. The lips of the wound, excepting the anterior portion which is permitted to remain open for dressing or drainage, are then sutured.

2. The second method of treatment is employed in the type of cyst in which there is distinct fluctuation upon digital palpation and in which the bone has

Fig. 7.—Adamantinoma of mandible.

been completely destroyed and the cystic membrane is noticed directly beneath the mucous membrane. Here, an incision is made through the mucous membrane, taking care not to cut the entire structure; the mucous membrane is completely dissected away, and the cyst is removed. The wound is then sutured; the anterior portion is permitted to remain open for the insertion of dressings or to maintain drainage.

3. The third method of treatment is employed in the type of cyst in which fluctuation is observed upon digital palpation, but is not so distinct as in the preceding instance since here the bone is not completely destroyed. The bone, however, is considerably thinned out and has taken on an eggshell-like consistency. When the tumor is compressed, the classical wavelike motion of fluctuation is not present. When the pressure is released, the tumor immediately assumes its original position, characteristic of the reaction of a spring. Both radicular or follicular cysts may present these characteristics, and this method is employed. An incision is made through the mucous membrane and the flap is

retracted. The overlying bone can easily be removed with the aid of the rongeur or hemostat forceps. A suitable portion of the overlying bone should be removed to give the operator a clear view of the entire cystic membrane. The cyst is then enucleated and the wound sutured. It is preferable to permit the anterior portion to remain open for dressing or for drainage.

ADAMANTINOMA

The radical resection of the entire jaw is sometimes desirable where a correct diagnosis of adamantinoma has been made. It is a less mutilating operation and is sounder surgery than is the conservative method employed in han-

Fig. 8.—Adamantinoma. Large nest of adamantine cells scattered through the tissue to the right of the large nest.

dling patients with these types of tumors. The reason why conservative methods of treatment have been considered practical and more generally resorted to in the past may be due to the confusion as to the locally malignant nature of these cysts and their tendency to recur after certain treatment. It may also have been due to the failure properly to diagnose adamantine tumors in the first place, and to differentiate these from radicular or dentigerous cysts.

The adamantinoma is really a hard jaw tumor and has also been called multilocular cyst or multilocular cystoma. These tumors rarely occur in the maxilla, but most often in the mandible. They are of various sizes ranging from small cystic cavities to extremely large ones, extending to the entire mandible. They may appear at any age. They are slow in growth, sometimes taking a period of

twenty to thirty years to cause discomfort. Occasionally, they grow rapidly and within a few years reach a large size. In our experience there is no preference to sex; they occur usually in persons between the ages of twenty and thirty years, although we have seen these tumors in patients of middle age and also in children.

DIFFERENTIATION BETWEEN CYSTS AND ADAMANTINOMAS

Survey of the statistical reports will disclose that adamantinomas appear much oftener than has generally been supposed. The ill end-results in some of these cases make it essential to resort to proper treatment at the very outset. Therefore, it is important to stress the value of a correct diagnosis.

For similar reasons it is essential to differentiate more precisely the common cyst from adamantinomas. Adamantine tumors have been reported in 1868 and were then designated as odontomas. The same neoplasm has been given various designations, among which are the following: adamantine epithelioma, cystosarcoma, adenocarcinoma, epithelial odontoma, cystoma, cystic tumor of the jaw, multilocular cyst of the jaw, adamantine tumor, chorioblastoma, and ameloblastoma.

Because of the many opinions that prevail as to the histogenesis of these tumors, those of dental origin have been classified in a most inadequate manner. Some have proposed classifications of cysts on the basis of being derivations of the tooth germ, while others have suggested a classification on the basis of their being the products of inflammation. Adamantine tumors are sometimes classified as unilocular or multilocular. Nevertheless the unilocular cysts which are diagnosed as such will radiographically be found to consist of a large number of smaller cysts. This point should be borne in mind as an aid in recommending the proper method of treatment. The usual classification of these tumors on the basis of their being solid or cystic is impractical because it will be found in the transitional type that one part of the tumor is solid, while another part of the same tumor is cystic. From the standpoint of prognosis, however, it is important to bear in mind the care of these tumors, whether they are solid or cystic, single or multilocular.

CLINICAL AND RADIOGRAPHIC DIAGNOSIS

Clinically it is difficult to make a final diagnosis. It should be supplemented by a radiographic examination. Radiographically, on the other hand, it is difficult to distinguish between an adamantinoma and a benign giant-cell tumor of central origin or an osteitis fibrosa cystica. In the follicular cyst, while the x-ray shadows show no structure of any kind, the tumor generally stands out in sharp relief from the rest of the healthy bone. In adamantinoma, the honeycombed structure may be seen with the aid of the radiograph. The radiographic examination shows these tumors to be of a honeycomb appearance, consisting of cavities or hollows arranged in one or more compartments within the jaw bone.

THE MEANING OF LOCAL MALIGNANCY

Adamantinomas are locally malignant in the sense that they may recur in the jaw over and over again, unless the tumor is thoroughly removed, leaving no

vestiges of any kind. This can best be accomplished by radical surgery. We have seen cases where, because of conservative treatment, it became necessary later on to resect the entire jaw; whereas, were a thorough job done in the first place, that patient might not have had to be subjected another time to a major surgical operation and lose the entire jaw.

These tumors do not metastasize to the degree which malignant tumors are known to do; however, cases of metastasis have been reported.

SYMPTOMATOLOGY

These patients present no early symptoms, a characteristic of most slowly growing tumors. This explains why patients come for treatment at that stage when the tumor reaches its highest development. The disturbing symptom in these cases is not pain but the disfigurement of the jaws. Sometimes a facial defect compels the patient to seek advice at the oral surgeon's office. Occasionally these tumors rupture into the mouth, and, if they do not heal, they may become infected, simulating a condition of osteomyelitis. Sometimes a loose tooth may be a beginning for complaint. In large cysts, the speech and mastication may be interfered with. The outstanding characteristic noted is the unevenness and the lobulated appearance of the tumor, seen especially in the radiogram.

These tumors are centrally expansive growths, and therefore are observed only at a later stage and are not diagnosed in their incipiency. They are sometimes confused with dentigerous and radicular cysts, and present differential diagnosis. They are more common in the colored race than among white people, according to some observers. Others believe that these tumors appear more often in females than in males.

ETIOLOGY

In some quarters the opinion prevails that these tumors do not arise from a tooth germ. It is generally believed that adamantinomas are of epithelial origin. There are three theories as to the ways in which these tumors may develop: (1) from the paradental epithelial rests, (2) directly from the tooth germ, and (3) directly from the alveolar epithelium. The widely accepted view today is that groups of epithelial cells exist alongside the peridental membrane extending from the gingival margin up to the apex of the tooth. These cells are derived from the enamel organ and are called the paradental epithelial débris. It is thought these cell groups are related in a manner to the supernumerary teeth of the third dentition. In other words, these tumors are not related directly to the development of the teeth. The second theory that the adamantinomas arise from the neoplastic transformation of the tooth germ is not supported today.

Histologically, these tumors are thought to arise from the embryonal rest of adamantine epithelium. Although the exact cause of these tumors is still a subject of considerable speculation, the explanation given by Mallassez, that the source for the formation of adamantinomas and odontomas may be traced to the epithelial rests which are activated to proliferation under certain conditions, is still receiving the greatest support.

He showed that the peridental epithelial débris may remain as scattered epithelial rests even late in life; in the embryonic jaw subsequent to tooth development these appear beneath the mucous membrane, while in adults they ap-

pear as remnants of the enamel organ, the epithelial cord distributed about the teeth and in the peridental membrane.

Partsch writes of their development as follows: "If the development of the tooth pulp is disturbed before its differentiation between connective tissuelike and epithelial elements, and if previous to that the tumorlike change of the enamel germ has commenced, tumors of an epithelial nature will result which, however, according to the changes to which they may be subjected, manifest different characters. The epithelium may proliferate in solid buds and thus give rise to firm tumors, or it may degenerate cystically, and in this manner produce so-called cystomas. These cystomas can be of unilocular or of a multilocular kind. To the unilocular cystomas probably belong the so-called 'toothless' follicular cysts."

CLINICAL PATHOLOGY

We recognize two clinical types, the cystic type which is more common and the solid type which is more or less rare. Clinically, the adamantinoma resembles the radicular, or dentigerous cysts. According to their origin, there are those that spring from the epithelial borders, and those which are situated deep in the alveolar process.

The mass is usually traversed by massive fibrous tissue trabeculae, which make up the bulk of the tumor. This stroma may be very cellular. The characteristics of the adamantinomas are masses of epithelium and broad anastomosing strands of epithelial cells. The epithelial masses undergo central degeneration and liquefy and leave central cavities in which fluid accumulates. These tumors involve the surrounding bone in a different manner than do the dental root cysts. While in the latter the cavity is clearly defined, as seen in the radiograph, the cavities are uneven, lobulated, and irregular. The fibrous capsular wall of the adamantinoma adheres to the bone, indicating that small filaments of the tumor tissue may extend from the capsule into the bone proper.

TREATMENT

Adamantinomas do not metastasize as a rule but are prone to recur. Clinically, these tumors may be characterized as being locally malignant. For that reason, surgery, combined with thorough electrodesiccation of the cystic area, would in a great measure prevent the recurrence of the tumor. A pathologic examination of the tissue should be made. The methods described above are employed with modifications for the needs of a given case.

These mouth tumors sometimes are very large and involve the entire mandible or half of the maxilla. They are slow in growth, taking as long as ten to twenty years to develop, and only then are noticed.

RADIOSENSITIVITY AND RADIORESISTANCE OF TUMORS

From an anatomic standpoint, we may classify tumors of the mouth into those involving the bone or hard structures, and those of the soft tissues. On the other hand, we also recognize tumors as benign or malignant, depending upon their tendency to invade neighboring tissues and cause their destruction.

In view of the combined treatment of adamantinomas by surgery and radium or x-ray therapy, advocated by some authorities, an important classification

of tumors should be kept in mind. Those tumors that respond to treatment with radium or x-ray are called radioactive or radiosensitive. An examination of these tumors shows that the nuclei in these cells dominate the cell substance and are deep staining. The tumor is well supplied with capillary blood vessels. They respond to radioactive treatment because it is believed the nuclei predominate. They are less malignant than the resistant type, and also grow slowly.

Tumors of the other type resist treatment by radium and x-ray and are called radioresistant. In these tumors the cell substance predominates. These tumors metastasize much more rapidly than the radioactive ones, and they run a much faster course. The tendency has been to group tumors according to their varying degrees of radiosensitivity, using this index as a means of determining the proper and suitable method of treatment. Adamantinoma is neither radiosensitive nor radioresistant.

RADICAL SURGERY—JAW RESECTION

The treatment of adamantinomas with surgery, followed by radium, is in my opinion a procedure which requires considerable additional investigation. Tumors that are radioresistant cannot be expected to respond to radiation therapy. Of course, the size of the tumor will largely determine the nature of the treatment and whether jaw resection is indicated. In general, it may be said that radium and deep x-ray therapy are of questionable value in the treatment of adamantinomas.

If the adamantinoma occupies only a small portion of the mandible, it is unnecessary to resect the entire jaw. When, however, the entire mandible is affected and when a recurrence after a conservative treatment is anticipated, it is my belief that the jaw resection is indicated and that only radical treatment promises the best results.

POSTOPERATIVE CARE

The usual postoperative treatment, consisting of irrigations of the wound until closed, is carried out. Should the use of x-ray or radiation therapy be determined upon, it should be started directly following surgical interference.

The periodic x-ray examination of the teeth and the systematic clinical examination of the mouth to detect any abnormalities of the jaw, will go a long way toward preventing the occurrence of these mutilating tumors. The public should be educated to the importance of correct diagnosis and thorough treatment. It is part of the campaign of the dental profession in preventive medicine to prevent this type of tumor from reaching proportions which will require heroic surgical interference.

Preventive dentistry is the watchword of the day in our profession. It has left such a profound impression on the public that the demand is increasing daily for this service. The dental school is imbued with this concept of prevention in every aspect of its educational effort. It would be erroneous to assume that prevention has no place in oral surgery. I believe that the study of cysts of the jaws will disclose to us many hitherto unexplored aspects of oral surgical problems which still beg for a solution. Every step forward we make in the diagnosis and treatment of these benign mouth tumors, the closer we come to the preventive ideal in oral surgery.

DRAINS AND DRESSINGS IN ORAL SURGERY AND EXODONTIA

WILLIAM H. CANAVAN, D.M.D., BOSTON, MASS.

DRAINS and dressings following the extraction of teeth and operations of minor surgery in the mouth and jaws have been of recent interest to the dental profession. While the general surgeon relies on drains to carry off infection in abdominal and orthopedic operations, the dentist and oral surgeon, until the past few years, has been obliged to depend wholly on nature to assist his patient in a speedy and entire recovery.

DRAINS

The existing principle of drainage in other parts of the body can be utilized in the mouth and jaws. Mindful of this situation, we can compare the opening and draining of an alveolar abscess or osteomyelitis of the jaw with similar treatment of a fulminating appendix or diseased bone tissue in the femur. An abscess in the bone or soft tissue of the mouth contains pus and necrotic tissue. Often there are also blobs of juicy necrotic material and lumps of fibrin infiltrated with pus cells as well as decomposed tissue in the discharge. The condition is exactly like an infected granulating wound in any part of the body. After incision an antibacterial lymph flow sets in with active phagocytosis for the purpose of killing the bacteria in the wound. If all the necrotic tissue does not pass out as a result of the incision, provision must be made for it to flow out gradually. Mechanical measures undertaken for this purpose are termed drainage. Gauze, rubber tubing, rubber dam, silkworm gut or tubes are introduced into the infected tissue to establish a channel to the surface from the center of activity in the infected tissue. Such drains first of all remove the danger of infection from scattered bacteria. Indeed in some cases drainage is positively a necessity. Unless drainage is established after incision of a deep alveolar abscess opening on the face, or if the soft parts fall together and heal before the necrotic tissue is separated, pus reaccumulates and reinfection takes place. The condition becomes as bad as that before operation, if not perchance worse.

It is evident, therefore, that drainage has its place in oral surgery just as in other branches of surgery. In the past this truth has not always been recognized, and many evils have resulted. I am a firm believer in the use of drains in the following conditions:

1. In deep bone wounds and in soft tissue infections. These comprise alveolar abscesses opening outside or inside the face, osteomyelitis, and other bone infections in the jaw following trauma from fractures or other injuries.

2. For the relief of pain, drainage with medication is indicated. Medicinal applications serve both to subdue infection and to control postoperative pain following extraction, incision, and curettage.

3. To control hemorrhage by pressure.

The choice of materials for drains is important. Gauze as a drain should be used in bone wounds and in alveolar sockets following the extraction of teeth. Rubber dam or rubber tubing is indicated in cases following incision on the face. This form of drainage offers a freer channel for material to be evacuated. It also takes less room and does not cause pain by terminal pressure.

A word in regard to technic of drains. As primary pack, gauze tape should be firmly inserted in order to effect a pressure necrosis from the abscessed walls. This will cause clean sloughing. It is allowed to remain for twenty-four hours and then should be changed daily to prevent absorption of necrotic material. This is continued until all signs of sepsis have disappeared, the drain being shortened with each successive dressing. It should be noted that if a drain of gauze is left in place too long, it becomes a foul smelling plug coated with a sticky, crusty edge, acting as a foreign body.

In some cases, rubber tubing is essential; for example, in osteomyelitis following a compound fracture or gunshot wounds. Rubber tubing has the advantage of reaching the center of infection; and, if a long period of drainage is necessary, the rubber tubing, which is firmly fixed, does not have to be changed as frequently as gauze.

In drainage by tube, the position must be seriously considered. The tube must be inserted at the lowest point possible, to obtain the aid of gravity in the drainage. It must be inserted with great care to prevent buckling in the center, which naturally impedes and may even prevent drainage. It must be inserted at exactly the right distance, as a tube half in defeats its own purpose just as does one forced too far. Through this tubing, daily irrigation can be carried out.

There are drains known as wicks, which are very small, are medicated and used principally for the relief of pain. They really partake of the nature of dressings, of which I shall speak later. They are indicated following the removal of unerupted and impacted mandibular third molars. They are necessary in cases following surgical removal of exostosed roots. Such a dressing of gauze firmly held in position when packed into the socket aids in controlling hemorrhage following extraction or laceration of tissue.

In septic wounds a dressing of aftex, on either plain or iodoform gauze, should be introduced. Plain gauze with mercurochrome is preferable in many cases because iodoform sometimes has an unfavorable reaction. In other cases the following drugs may be used: aftex, orthoform, thymol iodide, aspirin, white vaseline, and mineral oil.

After extraction of teeth with laceration of tissue, the resulting soreness and pain can be relieved by a dressing to that area, usually applied into the sockets of the extracted teeth. In some cases, orthoform powder may be blown in or a mild phenol preparation may be painted on the tissue, both for analgesic effect.

A suggestion is in order now for the postoperative treatment of normal extraction cases. I believe that free rinsing during the first twenty-four hours is responsible for many sore mouths and must be discouraged. Not only will secondary bleeding occur, but eventually a dry or infected socket may result. Instead, application of a strip of sterile gauze, doubled to twice the size of the

area involved and dipped in a warm saline solution, will prove most beneficial, but a dry sponge will do if the saline solution cannot be obtained.

Pericoronal infection is another condition in which a drain or wick is indicated, especially if it occurs around partly unerupted mandibular third molars. A wick with methylene blue may be inserted into the fold of tissue overlying the tooth, which brings a speedy change for the better, often within twenty-four hours. I find it is better to wait in this type of case until all signs of infection have subsided, either in whole or in part, before removing the tooth.

DRESSINGS

For years, active hyperemia induced by heat has been considered to have a favorable action on local inflammation. In the early stages of infection active hyperemia is one of the outstanding features. What degree of induced hyperemia is beneficial, added to the hyperemia already present, and at what stage it becomes harmful are still open questions. The idea prevails that heat in some form applied to the affected part hastens the formation of pus and the separation of the slough.

Heat may be applied by linseed or flaxseed poultices, electric pad, hot water bag, or a warm solution, such as saturated solution of epsom salts. It probably has a real influence in favoring the local defense reaction, relieving pain, and affording comfort. When a marked edema of the face persists after extraction and previous to opening for drainage of an abscess, hot epsom salt dressings changed every fifteen minutes have a wonderful effect, both in reducing swelling and in allaying pain, while marked soreness of gum tissue after incision inside the mouth for drainage is relieved by small flaxseed poultices, placed between gum and cheek and changed every half hour.

Cold may be used in the form of an ice bag or of a cloth wrung out in cold water. The treatment was originally applied because of the belief that the hot red area caused by the local defense reaction was harmful, and that the part must be cooled.

While it produces at first a transient anemia, the part later becomes red and congested, and according to Bier this hyperemia is supposed to extend well below the surface and is a form of passive hyperemia.

Antiseptic wet dressings may be made by soaking a sufficient amount of gauze in one part alcohol to three parts water. This is applied thoroughly wet to the part to be treated, covered with rubber tissue, and held in place firmly with a bandage. Such an application many times takes the place of an ice bag. It reduces swelling or acute inflammation, and also hastens suppuration of an alveolar abscess previous to incision, its effect being that of a poultice. However, when put on more loosely so that air gets under the rubber tissue, the alcoholic solution slowly evaporates, cooling the tissue and acting like an ice bag.

After an operation the action of cold applied directly to the face has a remarkable effect. Not only does the swelling diminish, but the patient seems easier and less harassed with pain. I firmly believe that if cold packs were used as a postoperative procedure after all operations there would be less grief for the dentist and for the patient.

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The Principles of Dental Medicine. By Dr. F. W. Broderick, St. Louis, 1936, The C. V. Mosby Co.

In this second edition, revised and rewritten seven years after the first one was published, Broderick has added a great deal of new material, most of which is confirming his earlier findings. His book deals primarily with the etiology and prevention of dental lesions. "But the natural corollaries which arise from the presentation, viz., that the essential features in the production of dental lesions are exactly the same as those which will bring about disease elsewhere within the body; that the dental lesions will appear as endpoints before organic change has occurred in organs and tissues elsewhere, on account of the special structure and environment of the teeth; that these consequently become signs and symptoms of disturbed physiology which are unmistakable on account of their visibility and ease of access; that these are preventable and that the method undertaken with this end in view will, at the same time, prevent the development of the more generalized disease with which they are so commonly associated; all demonstrate that the matter is of extreme importance to medicine."

The contents are divided into three main parts:

(1) General Physiologic Considerations.
(2) Dental Medicine.
(3) The Relation of Dental to General Medicine.

In the general physiologic considerations, the author stresses the fact that a fundamental antagonism exists between dental caries and pyorrhea alveolaris. Both conditions may be present at the same time in the same mouth, but only one of them may be active. The presence of a carious cavity does not mean that the caries is active; nor does the presence of a pyorrhea pocket prove that there is active pyorrhea. None of the many different theories which have been advanced by various investigators regarding the etiology of caries and pyorrhea are entirely satisfactory. The etiologies of the two diseases are interrelated, and to solve either, they must be considered together. The fundamental underlying cause is an imbalance in the vegetative system of the body. Dietetic, physiologic, or psychologic strains upon this system tend to alter the reaction of the saliva. These alterations, combined with other metabolic disturbances, bring about changes in the dental tissues which lead to their destruction.

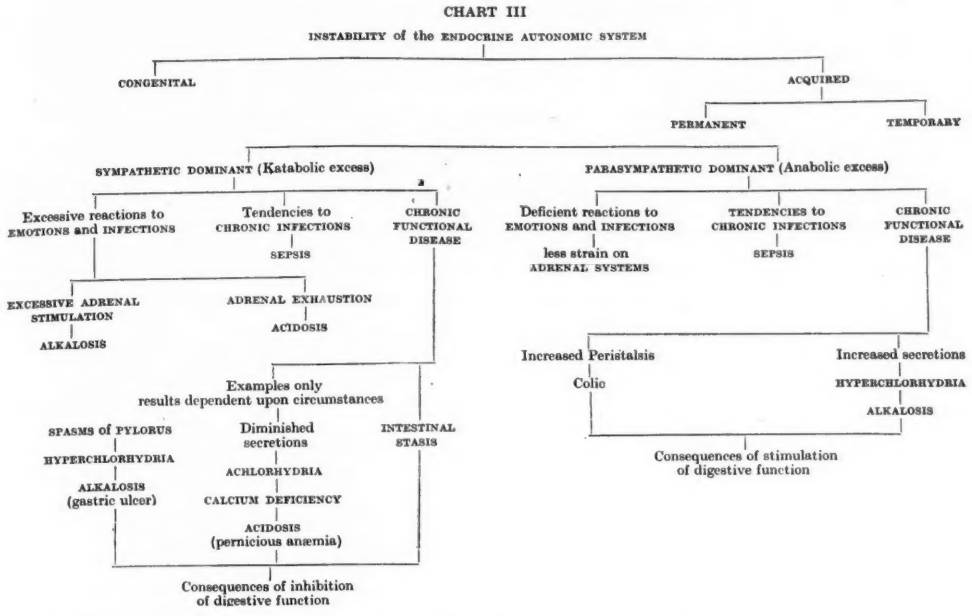
In order to prove this assumption it must first be demonstrated that the imbalance of the vegetative system can be expected to bring about those changes. This is done by a thorough study of the reaction of blood, saliva, and body tissues. Their acid-base reaction is slightly to the alkaline side of strict neutrality, and alterations to either side are possible only within the narrowest limits if life is to persist. The excretion in the urine is one of the methods by which the body eliminates excess acid or alkali. Another method is the neutralization of excess acids through ammonia followed by an elimination of the neutral salt through the kidneys. The third method is the elimination of acid as carbon dioxide by way of the lungs. If the acidity of the blood increases, respiration becomes increased in an effort to remove additional CO_2 from the lungs. Excess alkalinity of the blood, on the other hand, slows up respiration in order to preserve CO_2 for the neutralization of the increased alkali. In its effort to maintain its normal reaction, the blood is aided by buffer substances, the most important of which is alkali bicarbonate. If the equilibrium of carbon dioxide and base bicarbonate is disturbed, acidosis or alkalosis occurs with its typical symptoms of dyspnea, rapidity of pulse, and coma.

Another important point in the understanding of metabolic disturbances is the colloidal state in which all substances exist which compose living matter. In this state, particles of minute size are present in a liquid medium without being actually dissolved. The characteristics of the colloidal state are: an enormous development of surface in proportion to the total mass of substance. This involves surface tensions, electrostatic charges, Brownian movements, etc. An extremely fine equilibrium exists between the colloidal particles and the liquid, and there is a certain optimum point for best body functions. Disturbances lead either to dissolution or to precipitation of the particles and life is no longer possible. Microorganisms or other toxic substances act in this manner upon the body cells.

In this connection the various endocrine glands must also be considered, not only as separate entities but also as parts of a system: the vegetative system. The vegetative nervous system supplies all involuntary tissues and organs. It is composed of the sympathetic portion and the parasympathetic portion which is mainly represented by the vagus. Functions concerned with conservation of energy are innervated by the parasympathetic, those concerned with expenditure of energy, by the sympathetic system. For instance, intake of food, digestion, and evacuation are carried on by the latter, while the former acts only by delaying the process. The sympathicus also increases heart action and dilates the bronchioles, with the parasympathicus acting as antagonist. Endocrine glands permit a similar grouping:

Accelerator or Katabolic	*Retardator or Anabolic*
Thyroid	Parathyroids
Posterior pituitary	Anterior pituitary
Adrenal tissue	Inter-renal tissue
Glands of generation	Interstitial glands
	Pancreas

Chart III illustrates the workings of the endocrine autonomic system:



A study of diathesis and constitution reveals further pertinent data regarding the vegetative system. In some men the sympathetic portion predominates, in others the parasympathetic portion. This is a contributing factor to giving an individual immunity or susceptibility to certain diseases. Another differentiation is that into "acid" and "alkali" types of individuals. A similar classification distinguishes between adaptional exuberance and adaptional inadequacy. The adaptional exuberance type (sympathetic) has a superior endocrine equipment with the thyroadrenal system functioning to excess, with a quick pulse, high blood pressure, high metabolic rate, and a high resistance to disease. In the alternative group (parasympathetic) the thyroadrenal system is underactive, the metabolism rate slow, circulation sluggish, and resistance to disease low. The sympathetic type tends toward acidosis, the parasympathetic toward alkalosis.

By means of some of the data discussed, a new conception of disease processes was formed into a complete system of medicine by McDonagh. As discussed in connection with the colloidal state, the effect of microbic invasion of the body is either agglutination or dissolution of protein particles in body cells and in body fluids. The first stage of agglutination is enlargement of the particles (hydration), the first stage of dissolution is dissemination (dehydration). The refractive index of the serum, the Brownian movement, the sedimentation stability of the blood cells are indicative for such changes. Drugs act very much like the bacilli, and, in reality, there is only one disease: colloidal disequilibrium. Constitutional tendencies to hydration bring about the symptoms of sympathetic overactivity (acidosis), while tendency to dehydration leads to parasympathetic overactivity (alkalosis).

When the tendency toward acidosis or alkalosis is studied in the saliva, it is found that its buffer strength is very much lower than that of blood; conse-

quently an upset which does not affect the reaction of the latter, will change that of the former. This explains why the salivary reaction is more frequently disturbed than that of the blood. Moreover, there is a change with advancing age, the pH of saliva being higher in young than in old age. There exists a correlation between the reaction of saliva and that of blood, urine, respiratory function; and also the body metabolism at a given time has a deciding influence.

After these general physiologic considerations, the author broaches his main topic: dental medicine. The physiologic details dealt with in the previous chapters are now used to consider the etiology of dental caries and of pyorrhea from a wider angle. As far as the etiology of dental caries is concerned, the isoelectric point of the saliva plays an important part. At this point, no migration of protein in the electric field is observed. The normal saliva is slightly to the alkaline side of the isoelectric point, and the calcium ions in it will be attracted to the tooth. However, when lactic-acid producing organisms lower the pH of the saliva, the process is reversed and the tooth loses some of its ionic calcium compounds. The alkalinity of the saliva is, therefore, of infinite importance in the preservation of the tooth. It can give the tooth immunity from dental caries even in the face of fermenting carbohydrate foodstuffs. The saliva reaction, again, is dependent upon the acid-base balance of the blood. Imperfection of the tooth structure seems to be of little significance. Even the action of microorganisms is a secondary matter as it can be prevented through alkalinity of the saliva. Also diet plays only a small rôle because intake is only one part in the whole process of metabolism. A disturbance of the acid-base equilibrium, producing a more or less chronic state of acidosis, depletes the alkali reserve and changes the reaction of the saliva long before the buffers of the blood are used up. Immunity from or susceptibility to dental caries is, therefore, diagnosable through the reaction of the saliva. It is, however, but the index of the metabolism at a given time and it changes constantly.

The age incidence of pyorrhea suggests already a systemic origin. Unknown in childhood, it is rare in adolescent life, common in the forties and fifties, and uncommon again in old age. In complete antagonism to dental caries, the fundamental underlying cause of pyorrhea is alkalosis. This is the reason why they are not commonly found together, at least not in an active state. Old cavities must, of course, not be considered as expressions of active caries. Furthermore, marginal gingivitis is not included in the term pyorrhea, which is always associated with alveolar destruction. Under the influence of alkalosis, a change in the reaction of the saliva occurs which permits the deposition of subgingival calculus. In contradistinction to caries, the parasympathetic side of the vegetative system is dominant in pyorrhea. The infection of the pocket is a secondary matter.

In carrying out the thought contained in the previous chapter, the author now makes his suggestions regarding treatment. The patient's examination should include the determination of patient's saliva pH; pulse and blood pressure; blood sedimentation test; alkali reserve of the blood; ultramicroscopic examination of the blood; urinalysis.

For the prevention of caries and pyorrhea, five lines of approach are open:

1. (a) In caries, change of reaction of the saliva to the alkaline side in caries so that the passage of calcium ions may be from the saliva to the tooth rather than from the tooth to the saliva. (b) In pyorrhea, correction of colloidal disequilibrium.

2. Balancing the vegetative nervous system by stimulating the deficient side or by depressing the excessive side.

3. Correction of the calcium potassium ratio.

4. Establishing of colloidal equilibrium by dehydrating or hydrating the protein particles of the plasma.

5. Organotherapy.

In the third and last part of the book, in which he deals with the relation of dental to general medicine, the author first considers the way in which civilization has affected human beings by changing their environment. Instinctive behavior in its relation to the endocrine system, as altered by civilization, furnishes one instance of maladaptation of mankind to its environment which is of importance in the etiology of diseased conditions. Emotions like worry and fear are particularly increased by the effect of civilization, while, on the other hand, their possible outlets in the form of muscular activity are often made impracticable. Furthermore, modern conditions tend to cause life to proceed at a faster pace. Emotions stimulate those organs and glands which are innervated by the sympathicus and inhibit those innervated by the parasympathicus. They produce advantages and disadvantages to the individual according to whether the muscular exertion is possible of performances or not. These factors, together with psychologic factors, play a large part in the production of disease, in the treatment of which physical and mental healing must go hand in hand.

In the relation of dental to general diseases, the author also discusses dental sepsis as a factor in the etiology of disease. Then follow several chapters which deal with the particular dental lesions which are found in diseased conditions. Specifically described are the teeth in allergic diseases; arthritis; tuberculosis; malignant disease; diseases of the alimentary system; respiratory system; nervous system; diabetes; diseases of the skin; pregnancy and diseases of women; diseases of the eye; acute infectious fevers. Some illustrative case reports are added and also an appendix which tabulates the CaO, P_2O_5, acid base, and vitamin contents of food materials.

A critical evaluation of this book is rather difficult. Most of the ideas presented are so new and different from the ones commonly accepted that a yardstick for comparison is lacking. However this may be, the reviewer has not read a more interesting volume than this for many years past. The chapters on acidosis and alkalosis, on the colloidal state, on the vegetative system, on diathesis and constitution are fascinating in every respect. Hardly ever was the pH reaction of the blood explained in a more clever and more logical manner. Despite the newness of the colloidal theory and the diathetic theory as far as dentistry is concerned, one must bear in mind that they have been accepted in certain medical fields. Furthermore, various investigators in the

last few years have been working along similar lines as Broderick. There is no doubt that the new theories expounded must have an important bearing upon modern dentistry. Whether they are the final solution of the dental problem, as the author believes they are, cannot yet be determined. McDonagh's system of medicine attempts to simplify the etiology of diseases, but it requires a great many assumptions which again lead to complexity. To take marginal gingivitis out of the sphere of pyorrhea is an unsatisfactory procedure, and would indicate a difficulty of the etiologic theory to explain its symptoms. But besides these doubts, one feels that there is a great deal of truth in Broderick's observations, and one cannot help but admire the boldness of his thought and the logic with which he has cemented together the building stones of his theory. This book will go a long way toward a better conception of dental problems; and, I am sure no dentist will close its pages without saying: well, there was a book worth while reading.

E. N.

The Forum

Articles for this department should be sent to Dr. William R. Humphrey, 1232 Republic Bldg., Denver, Colo.

The Forum Department of the March issue of the *International Journal of Orthodontia and Oral Surgery* contained several articles relative to the initiation of orthodontic treatment. These remarks were contributed by Dr. Porter, Dr. Kemple, Dr. Anderson and Dr. Waldo. The editors of the Journal urge all readers to engage in this discussion.

W. R. H.

In re: The Oral Surgery Department of the International Journal

The interest manifest in oral surgery during the last fifteen years has increased to such an extent that it is almost impossible to get near enough to a clinician at any of our big clinics to see what he is doing.

Great progress has been made, both in diagnosis and in operative procedures during this time, and many of the leading men in our profession are specializing in oral surgery. Yet all this progress and interest have grown without the help of an official journal which is so essential for such research and progress. Every branch of medicine has its journal, which is accepted very enthusiastically.

Why not one for oral surgery as it relates to dentistry? I am delighted to know that this goal is to be realized immediately. The *International Journal of Orthodontia* has reestablished a department of oral surgery. Many of us remember when we were subscribers to this Journal, but when it soon discontinued the section devoted to oral surgery, we were greatly disappointed.

With a large group of capable teachers and specialists from whom to select correspondents, the editors of this Journal should have no trouble in making this the most successful dental publication.

The need is great and the facilities are adequate.

Let's go. Let us give it our heartiest cooperation and enter our subscription at once.

Mallory Catlett.

The Truth About Chrome Alloy

Percy Norman Williams, of Tucson, Ariz., relates his experiences with stainless steel in an article published in the December issue of the *Journal of the American Dental Association.* Reprints of this article were distributed to the profession by Baker and Company.

It appears that Dr. Williams has been unsuccessful in uniting stainless steel and retaining its physical properties. Therefore he bitterly criticizes the metal and states that it cannot be used safely in orthodontics.

This article questions the intelligence of orthodontists who are using chrome alloy or stainless steel. When Dr. Williams' paper appeared in the Journal it attracted some attention but was considered unworthy of serious consideration because the soldering technic was used. Most of us who have had an early acquaintance with chrome alloy have had similar experience with soldering and have therefore discarded this method some two or three years ago. His criticisms of the metal itself are not original because it is the same propaganda that is being distributed by the gold salesmen. Later on, reprints of this article were received from a commercial source as advertising matter, the purpose of which was obvious. I think that the majority of men in the orthodontic profession are intelligent enough to make their own decisions as to the value of stainless steel in orthodontic therapeutics.

Dr. Williams introduces his paper by stating that stainless steel dates back to the middle of the eighteenth century. If Dr. Williams had investigated more thoroughly he would have found that chromium, derived from the mineral chromite or chromic iron ore ($FeCr_2O_4$), was discovered by Vauquelin in 1797 and has been known to the scientific world for years as chrome steel. However, it was not brought to the attention of the general public until 1913, when an Englishman by the name of Brearly invented what is known as stainless steel.

The doctor from Tucson further states that he was baffled because the soldered joints broke down in the mouth, but he then discovered that this alloy was extremely susceptible to electrolysis and that galvanic action had caused the failure of 80 per cent of these joints. It would be interesting to know how he arrived at his conclusion because physicists at the University of Denver were unable to discover a cause and stated that it might be one of many thousand reasons for the solder to break down and they could not answer our problem.

Dr. J. L. Carman, of this city, has made intensive studies of galvanic action in the mouth, both alone and with Dr. George Warner, of the Smedley Dental Group. Space will not permit a detailed account of these findings, but the natural phenomenon of this material has proved conclusively that stainless steel has less galvanic action in the mouth than any other metal. An account of Dr. Carman's studies may be found in the *International Journal of Orthodontia and Oral Surgery.*

Stainless steel can be successfully soldered only under hydrogen atmosphere. Dr. Carman has successfully demonstrated the following: when one part of the appliance is soldered in hydrogen atmosphere and the other with the usual fluxes and open flame and both are placed in the mouth, the part soldered in hydrogen atmosphere is permanent and the other will break down within a very short time. If galvanic action is the cause of joints breaking down, why is it that both parts do not break down when put in the mouth at the same time?

In Dr. Williams' conclusion he states that stainless steel cannot be considered from any standpoint as a substitute for platinum alloys. May we state

here that stainless steel is not a substitute for platinum alloys but should be considered an advancement in the evolution of metallurgy in orthodontics.

The Bureau of Standards has set the following values as a minimum for orthodontic wires:

Ultimate tensile strength	150,000 lb. per square inch
Yield point	125,000 lb. per square inch
Elongation (hard)	4 per cent in 2 inches
Elongation (soft)	15 per cent in 2 inches

(All values are minimum.)

The table of chrome alloy wires will give you the strength and yield point of various sizes of this wire as tested by the Research Department of the United States Steel Corporation.

SIZE	ULTIMATE STRENGTH LB. PER SQ. IN.	% ELONGATION 2 IN.	YIELD POINT LB. PER SQ. IN.
0.008	326000	1 max.	270000
0.010	310000	1 max.	240000
0.015	308000	1-1.5	235000
0.018	309000	1 max.	240000
0.020	290000	1 max.	225000
0.022	290000	1 max.	225000
0.028	287000	1 max.	220000
0.030	285000	1 max.	220000
0.032	284000	1 max.	210000
0.036	274000	1 max.	210000

I am convinced that the soldering of stainless steel is a failure, chiefly because we cannot depend upon the permanency of the soldered joints. Therefore, we must resort to spot welding. During the past two and one-half years we have evidence of over one thousand orthodontic cases in which chrome alloy was used exclusively with spot welding and was found to be superior in every way to the soldering of gold platinum appliances. This means that over four thousand molar bands with buccal and lingual tubes, several thousand anterior bands with attachments, and many labial and lingual arches with auxiliary springs have been used. I refer to the offices of Dr. Ketcham and Dr. Humphrey, Dr. Brusse and Dr. Carman, and Dr. L. T. Walsh.

Spot welding is a new and definite technic, and its successful use depends upon the study and training of the individual, but when it is mastered, the operator will be rewarded by the saving of three-fourths of his operating time and will experience a thrill in assembling his appliances. Contrary to Dr. Williams' view we encourage the use of stainless steel because there are fewer broken appliances in the mouth, because it resists corrosion and stain under the most unfavorable conditions, because of its extreme hardness which prevents marring of appliances, because of its elastic limit and tensile strength, and because of its elasticity and springiness.

A. B. Brusse.

Surgical Treatment of Pyorrhea

There has been a great deal of discussion in dental meetings of late in regard to surgical treatment of pyorrhea. Following the reading of the last paper I

was privileged to hear in regard to this form of treating diseases of the peridental membrane and alveolar process, no time was given for discussion.

I am of the opinion that papers which are not freely discussed often leave the wrong impression in the minds of the listeners; these incorrect impressions no doubt account for the fact that certain men take up a new technic and employ it on young and old alike although more conservative treatment might better suffice.

I should like this matter of surgical treatment of pyorrhea discussed through the medium of the Forum. Perhaps there are other readers of the *International Journal of Orthodontia and Oral Surgery* who could throw light on this controversial subject.

W. R. H.

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Editorial

The Department of Dentistry for Children

The late Thomas A. Edison, upon being asked what he considered the greatest machine in existence, is quoted as having retorted that he regarded "the brain and soul of a little child" as the answer to that question. This remark is significant in that it reflects the opinion of a man with one of the finest minds ever found.

The practice of children's dentistry is not so new a subject as is sometimes believed. In A.D. 131 was written: "The lack of nutrition makes the teeth weak, thin and brittle. An excess of nourishment excites a kind of inflammation similar to that of the soft parts. A deficiency of nourishment not only causes the tooth to die away but also enlarges the cavities." Dental

caries is a matter of metabolism, which in turn is a very important feature of pediatrics. The student of medicine receives at most only a few lectures upon this subject; however, at the present time pediatrics is generally regarded as one of the most important departments of the entire science and practice of medicine.

The dental profession finally became conscious that children's dentistry had in past years been neglected in dental practice. Part of the dental profession became aware rather abruptly, it seems, that diseases of the mouth bear a very definite relation to general systemic disorders of the human body, and it then closely followed that the practice of dentistry for children should no longer be regarded as a "necessary evil" but as a fundamental part of dental practice more closely allied with medicine than any other specialty of dentistry.

Several years ago the editors of the *International Journal of Orthodontia* believed children's dentistry to be a field assured of tremendous advancement not only because of its naturally close relationship with scientific medicine but also because of the tremendous burst of enthusiasm exhibited by its corps of workers. The enthusiasm seemed to parallel that of the early history both of pediatrics in medicine and of orthodontia in dentistry. It was felt that there would be a real need for a journal to carry the message of the workers in this specialty throughout the world and that there existed a common interest as well between children's dentistry and the specialty of orthodontia. Accordingly, the services of one of the most talented and outstanding young workers in the field of children's dentistry, Dr. Walter T. McFall, were secured to edit the new department in the Journal, with the assistance of a number of well-known men. Dr. McFall worked enthusiastically and loyally in order that the Department of Dentistry for Children might creditably fulfill the mission for which it was intended.

It was with no small amount of regret that the Journal recently abandoned its Department of Dentistry for Children. From the publisher's standpoint the subject will require a longer pioneer period and more educational propaganda to realize its goal—this will require patience, money, and endurance in order to hold out through the period of development. From the editor-in-chief's standpoint it is difficult, in the present stage of the subject, to secure articles of interest which coordinate medical and dental treatment and which feature preventive health service for children. It is difficult to procure for publication manuscripts which take the premise that the mouth is the orifice of entry for all nutrition and that what happens to the alimentary tract has an important bearing on the rest of the body. Articles featuring nutrition and malnutrition or bacterial invasion of the body with the mouth as the port of entry are not plentiful, originating from the medically trained mind and written from the pediatric viewpoint.

The Journal, however, looks with satisfaction on the fact that it enjoyed the support and enthusiastic work of its associate editors who tried very hard to contribute this mite of literature to make children's dentistry a really great specialty. Dr. McFall will continue to have charge of all material on children's dentistry which is believed to be of interest to the readers of the

International Journal of Orthodontia, and to him and his staff go the sincere thanks of the editors and the publishers for three years of very difficult work in a loyal and sincere attempt to make the department both scientifically and economically possible. We like to think the department is only delayed and requires more time, patience, and money because of its very nature and educational requirements. It may require the lapse of sufficient time for a new generation of dentists to enter the field of practice, a generation whose heritage has not long decreed that the practice of children's dentistry is physically irksome to them.

The Journal, its publishers, and editors believe today, as they did three years ago, that children's dentistry is a most fertile, unexplored, and important field in dental practice; however, they are forced to face the obvious fact that it is a new specialty and that sufficient manuscript of an excellent character to support a vigorous department in the Journal is difficult to obtain, and that such a department, while highly meritorious, is difficult to operate on an economically sound basis. Under the guidance of Dr. McFall, however, they hope to publish from time to time outstanding articles pertaining to dentistry for children.

H. C. P.

News and Notes

The Thirty-Fourth Annual Meeting of the American Society of Orthodontists

St. Louis, April 20, 21, 22, and 23

The completed program for the thirty-fourth annual meeting of the American Society of Orthodontists, April 20 to 23, inclusive, promises all-round enjoyment for the members and their guests. In addition to the already announced scientific and clinical sessions, there will be a golf tournament at the Sunset Hill Country Club for the members of the Society, an interesting program of sight-seeing trips and entertainment for the women visitors, and the social high light of the meeting—the dinner dance at the swanky Club Continental of the Hotel Jefferson, the Society's headquarters. A delicious full course dinner and an elaborate floor show will precede an evening of dancing to the music of a nationally known orchestra.

The entertainment for the women will include visits to the Jefferson Memorial to see the Lindbergh trophies, to the home of Eugene Field, to the Art Museum, to the Forest Park Zoo, and to the Missouri Botanical Gardens (Shaw's Garden), the horticultural collections of which are second only to the Kew Gardens in London, England. The gardens cover a 75-acre tract in the heart of the city and are devoted to the culture of flowers, shrubs, and trees from all over the world. On Monday night when the members have their stag dinner following the golf tournament at Sunset Hill Country Club, the women guests will be entertained with a theater party.

A representative group of exhibitors specializing in orthodontic supplies will be found on the mezzanine floor of the hotel lounge.

NOTE.—Members of the Society are participating again in the certificate plan whereby a reduction in railroad fares will be effected if one hundred or more certificates are secured. Those planning to travel by train should inquire of their local ticket agents regarding the date when the tickets must be purchased and should not fail to ask for their certificate receipts. However, those residing in the territory of the Southeastern Passenger Association are not entitled to use the certificate plan.

The final program, which includes several changes from the preliminary announcement, is given in full.

Program of American Society of Orthodontists

HOTEL HEADQUARTERS—JEFFERSON HOTEL

MONDAY, APRIL 20, 1936

Morning Session

8:00 A.M.-9:00 A.M. Registration.
10:00 A.M. Executive Committee—Jefferson Hotel.

Afternoon Session

The golf tournament will be held at Sunset Hill Country Club. The golf course of this club is one of the most picturesque in the country and is sporty enough to be interesting to all golfers.

Prizes have been arranged for all classes participating in the event, and in the evening a stag dinner will be held at the Club. Transportation will be provided from the Jefferson Hotel to the golf club in the morning and afternoon. Members who are interested may play a round of golf in the morning.

Evening Session

7:00 P.M. Golf dinner—Sunset Hill Country Club. Award of golf prizes and fellowship dinner.

TUESDAY, APRIL 21, 1936

Morning Session

Registration.

9:00 A.M. Executive session. Report of Board of Censors. Report of Secretary-Treasurer. Report of Program Committee. Announcements. Address of Welcome. By Virgil Loeb, St. Louis, Mo.

10:00 A.M. President's Address. By H. C. Pollock, St. Louis, Mo.

10:30 A.M. The Diagnosis and Treatment of Dental and Mandibular Retroversions. By James D. McCoy, Los Angeles, Calif.

11:30 A.M. Case report: Distoclusion Case—Success or Failure? Why? By George R. Moore, Ann Arbor, Mich.

Afternoon Session

2:00 P.M. Paper: Orthodontics in the Field of Maxillofacial Surgery. By Lieut-Col. Leigh C. Fairbank, Washington, D. C.

3:00 P.M. Paper: Symptoms Associated With Disturbed Function of the Mandibular Joint. Study of One Hundred Cases. By James B. Costen, St. Louis, Mo.

4:00 P.M. Case report: Arrested Root Resorption During Orthodontic Treatment. By J. Lyndon Carman, Denver, Colo.

Case report: Manifest Evidence of the Cause of Relapse in Many Treated Cases of Malocclusion. By George W. Grieve, Toronto, Ontario.

Evening Session

7:30-11:00 P.M. General Clinics (special rooms—second floor).

Chrome Alloys

1. Electric Spot Welding of Chrome Alloy. By Leonard T. Walsh, Pueblo, Colo.
2. Soldering Chrome Alloy. By T. W. Sorrels, Oklahoma City, Okla.
3. Chrome Alloy Orthodontic Appliances. By J. M. Jones and J. Victor Benton, Wichita, Kan.
4. Chrome Appliances Used in My Practice. By Brooks Bell, Dallas, Tex.

Types of Appliances

5. A Simple, Efficient, and Inexpensive Appliance. By Clifford G. Glaser, Buffalo, N. Y.
6. Stationary Lingual Loop Appliance, Technic of Construction and Treatment. By Chilton E. Byington, Chattanooga, Tenn.
7. Appliances for Treating Overbite Cases of Malocclusion. By Howard D. Keeler, Des Moines, Ia.
8. The Use of an 0.015 × 0.0218 Steel Arch Wire in Starting a Case to Be Treated With the Edgewise Mechanism. By Ralph P. Howarth, Cleveland, Ohio.
9. The Application of the Incline Plane in Conjunction With Intermaxillary Elastics in the Treatment of Distoclusion Cases With Overbite. By Willard A. Gray, Rochester, N. Y.
10. A. The New Snap-Lock Labial and Lingual Attachments.
    B. An Instrument for Determining and Equalizing the Forces to Be Applied to Teeth in Orthodontic Treatment. By Landis H. Wirt, South Bend, Ind.
11. Coiled Spring to Open Spaces, Adjunct to Russel Lock. By Richard Lowy, Newark, N. J.
12. Uses of the Modified Wire Coil Appliances. By W. B. Stevenson, Amarillo, Tex.

13. Motion Pictures of the Construction of Labial and Lingual Arches. By Van A. Stilley, Jr., Paducah, Ky.
14. Various Applications of the Bite Plane Principle for Correcting Mesiocclusion and Distoclusion Cases. By C. W. Bruner, Waterloo, Iowa.

Molar Bands

15. A Simple Method of Making Molar Bands That Fit. By Allen E. Scott, San Francisco, Calif.
16. The Six Parts in the Making of Reinforced Anchor Bands for Molar Teeth. By Jesse F. Keeney, Quincy, Ill.
17. Anchor Bands by Indirect Technic. (Twenty Years' Refinement.) By L. M. Waugh, H. U. Barber, Jr., and G. S. Callaway, New York, N. Y.

Treatment

18. The Treatment of Maxillary Incisors in Mixed Denture Cases to Prevent Cuspids From Erupting Labially to the Lateral Incisors. By Harry L. Morehouse, Spokane, Wash.
19. Early Facial Corrections. By Kirman E. Taylor, Denver, Colo.
20. Treatment of Impacted Central Incisors. By Burton A. Hoffman, Buffalo, N. Y.
21. Interesting and Positive Method of "Erupting" an Imbedded Cuspid Without Mutilating or Making Any Attachment to the Cuspid Tooth. By Archie C. Gifford, Oshkosh, Wis.
22. The Practical Application of Milo Hellman's Research on the Growth of the Face and the Development of the Dentition, Showing Treated Cases With the Appliances Used. By M. A. Munblatt, New York, N. Y.
23. Examples of Compromise Treatment. By S. Stuart Crouch, Toronto, Canada.
24. Models Showing Some Results Obtained by Early Treatment. A New Material Which Provides a New Method for Treating Children With Cleft Palate. By Harry W. Perkins, Boston, Mass.
25. Cases Under Treatment. By A. B. Thompson, Des Moines, Ia.
26. A. A Case of Maxillary Fracture Involving Bones of Orbit, Satisfactorily Treated by Orthodontic Interference.
    B. Bringing Unerupted Cuspid Teeth Into Plane of Occlusion by Spring Force, With Auxiliary Core Attached. By Irving Spenadel, New York, N. Y.

Retention

27. Functional Retention (Zipper Type) in Supraclusion Cross-Bite and Open-Bite Cases. By Thomas M. Robertson, Coffeyville, Kan.
28. A. All Wire Retainer.
    B. Removed Latch Wire Idea.
    C. Chin Retractor. Class III Cases. By W. E. Stoft, Omaha, Neb.
29. Some More Removable Bite Planes, Guide Planes and Retainers. By Andrew F. Jackson, Philadelphia, Pa.

Results of Treatment

30. Bite Planes. By Hugh G. Tanzey, Kansas City, Mo.
31. Some Results From Early Treatment in Cases With Crowded Mandibular Incisor Teeth. By A. A. Somerville, Toronto, Canada.
32. A. Tongue Habits—Two Severe Cases With End-Results.
    B. Possibilities in Treatment of Missing Maxillary Lateral Incisors. By Harold E. Sippel, Buffalo, N. Y.
33. Open-Bite in Identical Twins. By G. Hewett Williams, Chicago, Ill.

Interesting Cases

34. A Few Unusual Orthodontic Cases (Fracture Case; Cleft Palate Cases, etc.). By Frank S. Cartwright, Detroit, Mich.
35. Orthodontia and Prosthodontia. (Photographic portrayal of results obtained through their coordination.) By Harry H. Sorrels, Oklahoma City, Okla.
36. A Little Experience With Cleft Palate Cases. By W. E. Lundy, Memphis, Tenn.

Aids in Treatment

37. A Practical Head Positioner as Used in a New Technic for Temporomandibular Joint Radiographs. By L. B. Higley, Iowa City, Iowa.
38. A Simple Method Found Useful in Determining Possible Tooth Positions in Mutilated Cases and Adult Cases. By Frank Nash, Scranton, Pa.
39. Record Keeping of Shedding of Deciduous Teeth and Eruption of Permanent Teeth. By Asa J. LaGrow, Oak Park, Ill.
40. A Demonstration of Root Absorptions Caused by Erupting Cuspids, Accompanied by X-ray Pictures and Models Showing the Results of Treatment. By Howard J. Buchner, Oak Park, Ill.
41. Silver Nitrate as a Protection Against Caries Beneath Anchor Bands. By Frederic T. Murlless, Jr., Hartford, Conn.
42. Metal Casts for Making Appliances. By Paul R. Nolting, Springfield, Mo.

Photography

43. Clinical Photography of Orthodontic Cases. By Howard E. Strange, Chicago, Ill.
44. Miniature Photography. By A. C. Broussard, New Orleans, La.

Miscellaneous

45. Practical, Time-Saving Orthodontic Instruments. By Earl W. Swinehart, Baltimore, Md.
46. Modelling Compound Impressions With Improved Heater. By Walter J. Furie, Long Beach, Calif.
47. Diagnostic Chart Protecting the Orthodontist. By Homer B. Robison, Hutchinson, Kan.
48. A Motion Picture Showing Several Series of Radiographic Studies Taken at Different Stages of Development. By Arlo M. Dunn, Omaha, Neb.

WEDNESDAY, APRIL 22, 1936

Morning Session

9:00 A.M. Paper: Class III Malocclusion of the Teeth as a Part of the General Problem of Orthodontia. By Milo Hellman, New York, N. Y.

10:00 A.M. Paper: Studies in Palatograph. By Miss Nena Kate Ramsey, Abilene, Texas.

11:00 A.M. Case report: Case of Hemiacromegaly—Showing Eruption of Maxillary Right Permanent Cuspid and Mandibular Right First Bicuspid at Four and One-Half Years of Age. By E. B. Arnold, Houston, Tex.

11:30 A.M. Case report: Class I Malocclusion, With Pronounced Anterior Open-Bite, in the Mouth of a Monkey, Induced by Constant Finger-Sucking. By Harry E. Kelsey, Baltimore, Md.

12:00 NOON. Past presidents' luncheon. Executive officers are cordially invited to attend.

Afternoon Session

1:30 P.M. Paper: Efficient Practice Management as a Means of Increasing Quality and Extending the Availability of Orthodontic Service. By Floyd E. Gibbin, Buffalo, N. Y.

2:30 P.M. Paper: General Growth Stages as Correlated With the Ossification of the Bone Centers of the Hand. By Clinton C. Howard, Atlanta, Ga.

3:15 P.M. Case report: The Treatment of a Unilateral Distoclusion Case With an Extreme Overbite. By Richard A. Smith, Evanston, Ill.

3:30 P.M. Case report. Problems which were not given consideration in the beginning of treatment but which became increasingly important during treatment and since its conclusion. (Three cases will be illustrated, at least fifteen lantern slides.) By George M. Anderson, Baltimore, Md.

3:45 P.M. Case report: The Treatment of Two Open-Bite Cases. (Motion pictures of each case showing abnormal muscular function.) By Howard E. Strange, Chicago, Ill.

4:00 P.M. Executive session. Report of President's Address. Report of committees. Election of officers.

Evening Session

7:00 P.M. Dinner dance and entertainment (informal) in the Club Continental, Hotel Jefferson.

THURSDAY, APRIL 23, 1936.

Morning Session

9:00 A.M. Paper: Etiology, Diagnosis and Treatment of Class II, Division 1. By Gerald Franklin, Montreal, Quebec.

10:00 A.M. Paper: An Orthodontic Diagnosis Based Upon Osseous Structure. By F. Vernon Fisk, Toronto, Ontario.

11:00 A.M. Case report: A Distoclusion Case. By Hugh T. Berkey, Fort Wayne, Ind.

11:15 A.M. Case report: Cooperation. By Harvey G. Bean, Toronto, Ontario.

11:30 A.M. Case report: Report of a Multilated Case in Which Early Orthodontic Interference Prevented an Otherwise Hopeless Deformity. By Hugh Grun Tanzey, Kansas City, Mo.

12:00 NOON. Luncheon.

Afternoon Session

1:00 P.M. Lecture clinics (special rooms—second floor). These six lecture clinics will be presented simultaneously and each will be presented three times. Each lecture will last forty minutes with a ten-minute intermission. Hence the following schedule:

First lecture	1:30 to 2:10 P.M.
Second lecture	2:20 to 3:00 P.M.
Third lecture	3:10 to 3:50 P.M.

Admission to clinic rooms by ticket only.

1. Presenting a Standardized Technic of Fabricating Chrome Alloy by Spot Welding. By Archie B. Brusse and J. Lyndon Carman, Denver, Colo.

The clinic will include motion pictures of approximately ten minutes' duration. The remainder of the time will be devoted to a demonstration of the technic of spot welding. This technic has been standardized and will be found far superior to that shown in any of the previous clinics. There will also be a table display of appliances made by various men throughout the country who are now using chrome alloy in their practice.

2. Analysis of Malocclusion. By George W. Grieve, Toronto, Canada.
   By means of photographs of patients and original casts, properly marked, it will be shown what changes have taken place in the denture, and thus the procedure for successful correction will be outlined. Final photographs and casts during treatment and years after completion verify the correctness of the analysis.
3. The Treatment of Open-Bite Cases. By William R. Humphrey, Denver, Colo.
   This clinic will show failures as well as successful results in the treatment of open-bite cases. It will stress the limitations in treatment of this type of malocclusion.
4. Construction of Appliances. By Ernest N. Bach, Toledo, Ohio.
   The lecture will be devoted to the physical and chemical properties of metals used in orthodontia, the construction of bands, labial and lingual arches, and various types of springs, points to be observed in soldering, and other similar phases relating to the subject.
5. Informal Discussion of Myofunctional Treatment. By Alfred Paul Rogers, Boston, Mass.
   The purpose of the informal discussion on myofunctional therapy is to provide an opportunity for those interested in the subject to consider informally its various aspects and to study in detail its application to patients. Models, charts, and motion pictures will be used as aids to understanding.
6. Ectopic Eruption of Teeth; Its Effect and Control. By Samuel J. Lewis, Detroit, Mich., and R. C. Willett, Peoria, Ill.
   Ectopic eruption of the permanent teeth often causes a premature loss of adjacent deciduous teeth, disturbing the arch continuity and resulting in certain types of malocclusion. This clinic will cover the various types of these eruptions, how to discover them early in life, and what measures may be taken to control and correct them.

4:00 P.M. Business session. Reports. Installation of officers.

American Board of Orthodontia

A meeting of the American Board of Orthodontia will be held at the Jefferson Hotel, St. Louis, on April 17 and 18. Those orthodontists who desire to qualify for a certificate from the Board should secure the necessary application from the secretary. The application must be returned to the secretary, together with any other required credentials, at least sixty days prior to the date of examination. Applications filed at the time of the board meeting will have preliminary consideration, so that the applicant may be advised of the work required for his subsequent examination. Attention is called to the following resolutions adopted by the Board:

Any person desiring to make application to the Board for a certificate shall have been in the exclusive practice of orthodontia for a period of not less than five years or an equivalent to be determined by the board and based upon the following conditions:

1. He must be an instructor in orthodontia in a school satisfactory to the Board.

2. He must be an associate in the office of an orthodontist whose standing is satisfactory to the Board.

3. It is definitely to be understood that any person at the time of making application for a certificate shall be in the exclusive practice of orthodontia in his own name.

OREN A. OLIVER, President.
CHARLES R. BAKER, Secretary,
636 Church Street,
Evanston, Ill.

American Society for the Promotion of Dentistry for Children

The annual meeting of the American Society for the Promotion of Dentistry for Children will be held in the Francis Hotel, San Francisco, Calif., on July 13 and 14, 1936. Interesting and helpful papers, table clinics, and practical demonstrations will be given covering all phases of dentistry for children. A round table luncheon will be held on Monday, July 13, at 12:30. All sessions will be held at the Francis Hotel, and every member of the American Dental Association and the Canadian Dental Association will be most welcome.

WALTER T. MCFALL, President.
JOHN C. BRAUER, Secretary.

American Dental Assistants Association

The twelfth annual meeting of the American Dental Assistants Association will be held in San Francisco, Calif., July 13 to 17, 1936. Headquarters will be at the Hotel Whitcomb. For further information please address

LUCILE S. HODGE, General Secretary,
401 Medical Arts Building,
Knoxville, Tenn.

North Carolina Dental Society

The sixty-second annual meeting of the North Carolina Dental Society will be held May 11, 12, 13, in the Carolina Hotel at Pinehurst, N. C.

All members of the American Dental Association are cordially invited.

FRANK O. ALFORD, Secretary
405 First National Bank Bldg.
Charlotte, N. C.

Tennessee State Dental Association

The next meeting of the Tennessee State Dental Association will be held in Memphis, May 11, 12, and 13, 1936, at the Peabody Hotel.

J. FRANK BIGGER, President,
Medical Arts Building,
Memphis, Tenn.

E. J. JUSTIS, Sec'y-Treas.,
Exchange Building,
Memphis, Tenn.

Dental Society of State of New York

The sixty-eighth annual meeting of the Dental Society of the state of New York will be held May 12-15, 1936, at the Waldorf-Astoria Hotel in New York City.

A cordial invitation is extended to all ethical dentists to attend the sessions.

Further information may be obtained by writing to:

DR. CHARLES M. MCNEELY, President
1 Nevins Street
Brooklyn, N. Y.

DR. A. P. BURKHART, Chairman Program Committee
57 E. Genessee St.
Auburn, N. Y.

Ontario Dental Association

The annual convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, Ontario, May 18, 19, 20. Dentists from the United States and from parts of Canada outside of Ontario will be welcomed as guests.

British Empire Dental Meeting

The British Empire Dental Meeting will be held in London during the last week of July. A large delegation of Canadian dentists will be in attendance and will leave Montreal on July 10. Dr. Fred J. Conboy of 86 Bloor St. W., Toronto, Ontario, is chairman of the Arrangements Committee.

Postgraduate Course in Periodontia at New York University College of Dentistry

The New York University College of Dentistry will hold its third annual postgraduate course in periodontia for two weeks, full day; or for four weeks, mornings only, beginning July 6, 1936. Courses are limited to fifteen men.

The course will include etiology, diagnosis, and treatment of periodontal disease. Various technics of pocket eradication will be considered and conservative treatment stressed. Vincent's infection; diagnosis of types of bone resorption; mouth manifestations of systemic disease; periodontal foci of infection; toothbrushing; instrumentation; balancing of occlusion. Taught by lectures and clinical work, each student treating several cases.

Instruction by Drs. Samuel Charles Miller, Sidney Sorrin, J. Lewis Blass, and the entire periodontia faculty.

For information and application, address Periodontia Department, New York University College of Dentistry, 209 East 23rd Street, New York, N. Y.

SAMUEL CHARLES MILLER,
Associate Professor of Periodontia.

Ninth International Dental Congress of the F. D. I. in Vienna

In Vienna, Austria, from August 2-8 inclusive, the Ninth International Dental Congress of the Federation Dentaire Internationale will be held.

French Society of Dentofacial Orthopedics

The annual meeting of the French Society of Dentofacial Orthopedics will be held in Brussels on May 21, with Dr. L. de Coster presiding. All who are interested in dentofacial orthopedics are cordially invited to contribute to the program and to attend the meeting.

American Association of Women Dentists

The American Association of Women Dentists will meet at San Francisco, July 13 to 17.

Dr. Virginia Trembly,
317 Burns Building,
Colorado Springs, Colo.

Note of Interest

Dr. William R. Humphrey, of the former partnership, Drs. Ketcham and Humphrey, will continue the practice at 1232 Republic Building, Denver, Colo., with Dr. George H. Siersma, associate.